GE
Measurement & Control

Moisture

moisture.IQ

User's Guide

imagination at work

910-298 Rev. A_14
March 2014

moisture.IQ

Hygrometer

User's Guide

910-298 Rev. A_14
March 2014

www.ge-mcs.com

©2014 General Electric Company. All rights reserved.
Technical content subject to change without notice.

[no content intended for this page]

Chapter 1. Installation and Wiring

1.1 Introduction 1
1.2 Unpacking the moisture.IQ 1
1.3 Installing the moisture.IQ 1
1.4 Choosing a Site 2
1.4.1 General Guidelines for Choosing a Site 2
1.4.2 Low Voltage Directive 2
1.5 Moisture Probe Considerations 3
1.5.1 Temperature Range 3
1.5.2 Moisture Condensation 3
1.5.3 Static or Dynamic Use 3
1.5.4 Pressure 4
1.5.5 Long-Term Storage & Operational Stability 4
1.5.6 Freedom from Interference 4
1.5.7 Corrosive Materials 4
1.6 Sample System Guidelines 5
1.6.1 Moisture Sample Systems 5
1.6.2 Oxygen Sample Systems 6
1.7 Mounting the System 7
1.7.1 Mounting the Electronics Unit 7
1.7.2 Mounting the Sample System 7
1.7.3 Mounting the Oxygen Cell Assembly 8
1.8 Installing the Probes 9
1.8.1 Moisture Probes 9
1.8.2 Pressure Sensors 10
1.8.3 Delta F Oxygen Cell 10
1.9 Making Electrical Connections 12
1.9.1 Using the Lever to Make Wiring Connections 13
1.9.2 Connecting the Power 13
1.9.3 Connecting Moisture Probes 14
1.9.4 Connecting the Delta F Oxygen Cell 19
1.10 Establishing a Gas Flow Through the Oxygen Cell 24

Chapter 2. Initial Setup

2.1 Entering Instrument Settings — the Settings Menu 28
2.1.1 Entering System Settings 29
2.1.2 Entering Display Settings 30
2.1.3 Setting up E-mail Notifications 31
2.1.4 Setting Up the Fault Alarm 32
2.1.5 Setting up Range Errors 33
2.1.6 Setting up the Sensor Modules 34
2.1.7 Creating and Saving Backup Files — the File Manager 35
2.2 Configuring and Setting up the Probes 36
2.2.1 Configuring the Probes 37
2.2.2 Calibrating the Probes 40
2.2.3 Entering User Functions 41
2.2.4 Entering User-Defined Tables 43
2.2.5 Entering User Constants 44
2.2.6 Entering Saturation Constants for Moisture Measurement in Liquid Hydrocarbons 45
2.2.7 Setting up moisture.IQ Communications 46
2.3 Entering Outputs and Alarms 48
2.3.1 Setting up the Outputs 48
2.3.2 Testing the Output 48
2.3.3 Trimming Outputs 49
2.3.4 Setting up the Alarms 51
2.3.5 Setting up and Running Logs 52

Chapter 3. Remote Programming over the Ethernet

3.1 Connecting to an Ethernet LAN 55
3.2 Enabling the Ethernet Option 55
3.3 Dynamic / Static Address 55
3.4 Static Addressing 55
3.5 Domain Name System (DNS) 56
3.6 Capabilities of the Ethernet Connection 56
3.6.1 The Admin Account 57
3.6.2 The Operator Account 59

Chapter 4. Maintenance

4.1 Delta F Oxygen Cell Electrolyte 62
4.1.1 Checking the Electrolyte Level 62
4.1.2 Replenishing the Electrolyte 63
4.2 Adding/Removing a Channel Module 63
4.3 Replacing and Recalibrating Moisture Probes 64
4.4 Calibrating the Delta F Oxygen Cell 64
4.4.1 Displaying Oxygen Content in PPMv and µA 64
4.4.2 Checking the Oxygen Cell Calibration 65
4.5 Delta F Oxygen Cell Background Gas Correction Factors 66
4.5.1 Correcting for Different Background Gases 66
4.5.2 Entering the Current Multiplier 67

Chapter 5. Troubleshooting

5.1 Screen Messages 70
5.2 Common Problems 72

Chapter 6. Specifications

6.1 Overall Specifications 75
6.2 Moisture Measurement 76
6.3 Pressure Measurement 77
6.4 Temperature Measurement 77
6.5 Oxygen Measurement 77
6.6 Electronic Specifications 78
6.7 Output Specifications 79
6.8 Input Specifications 80
6.9 Probe Specifications 81
6.9.1 Moisture Image Series Probe or MISP2 81
6.9.2 M Series Probe 83
6.9.3 Delta F Oxygen Cell 84

Appendix A. Menu Maps

A.1 Main Menu Map 87
A.2 Output and Alarm Menu Map 88
A.3 Configuration Menu Map (Part 1) 89
A.4 Configuration Menu Map (Part 2) 90
A.5 Logger and Data Element Editor Menu Map 91

Appendix B. Certification and Safety Statements

B.1 Installation 93
B.2 Special Conditions for Safe Use 95
B.3 Markings 95

Appendix C. Installation Drawings

C.1 Benchtop Model. 97
C.2 Rack Mount Model 98
C.3 Panel Mount Model. 99

Appendix D. Updating moisture.IQ Firmware

D.1 Steps for Updating Firmware 101

Appendix E. Modbus Maps

Information Paragraphs

Note: *These paragraphs provide information that provides a deeper understanding of the situation, but is not essential to the proper completion of the instructions.*

IMPORTANT: *These paragraphs provide information that emphasizes instructions that are essential to proper setup of the equipment. Failure to follow these instructions carefully may cause unreliable performance.*

CAUTION! This symbol indicates a risk of potential minor personal injury and/or severe damage to the equipment, unless these instructions are followed carefully.

WARNING! This symbol indicates a risk of potential serious personal injury, unless these instructions are followed carefully.

Safety Issues

WARNING! It is the responsibility of the user to make sure all local, county, state and national codes, regulations, rules and laws related to safety and safe operating conditions are met for each installation.

Auxiliary Equipment

Local Safety Standards

The user must make sure that he operates all auxiliary equipment in accordance with local codes, standards, regulations, or laws applicable to safety.

Working Area

WARNING! Auxiliary equipment may have both manual and automatic modes of operation. As equipment can move suddenly and without warning, do not enter the work cell of this equipment during automatic operation, and do not enter the work envelope of this equipment during manual operation. If you do, serious injury can result.

WARNING! Make sure that power to the auxiliary equipment is turned OFF and locked out before you perform maintenance procedures on the equipment.

Qualification of Personnel

Make sure that all personnel have manufacturer-approved training applicable to the auxiliary equipment.

Personal Safety Equipment

Make sure that operators and maintenance personnel have all safety equipment applicable to the auxiliary equipment. Examples include safety glasses, protective headgear, safety shoes, etc.

Unauthorized Operation

Make sure that unauthorized personnel cannot gain access to the operation of the equipment.

Environmental Compliance

Waste Electrical and Electronic Equipment (WEEE) Directive

GE Measurement & Control Solutions is an active participant in Europe's Waste Electrical and Electronic Equipment (WEEE) take-back initiative, directive 2012/19/EU.

The equipment that you bought has required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment.

In order to avoid the dissemination of those substances in our environment and to diminish the pressure on the natural resources, we encourage you to use the appropriate take-back systems. Those systems will reuse or recycle most of the materials of your end life equipment in a sound way.

The crossed-out wheeled bin symbol invites you to use those systems.

If you need more information on the collection, reuse and recycling systems, please contact your local or regional waste administration.

Visit http://www.ge-mcs.com/en/about-us/environmental-health-andsafety/1741-weee-req.html for take-back instructions and more information about this initiative.

Chapter 1. Installation and Wiring

1.1 Introduction

Users typically install the moisture.IQ as part of a complex process system, which includes components such as filters, pumps, and pressure regulators. In such an environment, probes and other parts of the system may be subjected to environmental hazards, such as high temperature, pressure extremes, corrosive elements and mechanical vibrations.

This section contains information and instructions for installing the moisture.IQ into a process system taking into account all of the above factors. The following section describes how to set up and connect it.

If you have questions about installation, call our technical support department. See the rear cover of this manual for contact information.

1.2 Unpacking the moisture.IQ

Before beginning the installation, unpack the unit and make sure all the parts and documentation listed on the packing slip are included. Be sure to inspect each piece of equipment, including the sample system, for evidence of mishandling. If anything has been damaged or is missing, report this to the carrier and to GE immediately.

1.3 Installing the moisture.IQ

To install the moisture.IQ, please refer to Appendix C at the end of this chapter and to the drawing listed for your specific configuration (benchtop, rack mount or panel mount).

WARNING! To ensure the safe operation of this unit, you must install and operate the moisture.IQ as described in this user's manual. In addition, be sure to follow all applicable safety codes and regulations for installing electrical equipment in your area.

1.4 Choosing a Site

You should have discussed environmental and installation factors with a GE applications engineer or field sales person by the time you receive the meter. The equipment should be suited to the application and installation site.

The moisture.IQ is available in rack, bench, or panel mounts that are suitable for most indoor installations. GE also provides weatherproof and explosion-proof housings for outdoor and hazardous area locations. See the drawings at the end of this chapter for an example of each enclosure.

Before installing the unit, read the guidelines below to verify that you have selected the best installation site.

1.4.1 General Guidelines for Choosing a Site

- Choose an installation site for the probes and sample systems that is as close to the process line as possible. Avoid long lengths of connecting tubing. If long distances are unavoidable, a fast sampling by-pass loop is recommended. Do not install any other components, such as filters, ahead of the probes or sample system unless instructed to do so by GE.
- Observe all normal safety precautions. Use the probes within their maximum pressure and temperature ratings.
- Although the moisture.IQ may not need to be accessed during normal operation, install the electronics unit at a convenient location for programming, testing and servicing. A control room or instrument shed are typical locations.
- Locate the electronics unit away from high temperatures, strong electrical transients, mechanical vibrations, corrosive atmospheres, and any other conditions that could damage or interfere with the meter operation. See Chapter 6, *Specifications,* for limits.
- Protect the probe cables from excessive physical strain (bending, pulling, twisting, etc.).
- Observe the proper cable restrictions for the probes. You can locate the Moisture Image Series probe up to 915 meters (3000 feet) away from the electronics unit with unshielded twisted pair cable. The M Series probes require specially shielded cable. You can locate the M probes up to 600 meters (2000 feet) from the unit.

1.4.2 Low Voltage Directive

If the power mains switch on the unit remains accessible to the user after installation a disconnect device is not required. However, should installation block access to the power mains switch for compliance with the EU's Low Voltage Directive (IEC 61010), this unit then requires an external power disconnect device such as a switch or circuit breaker. The disconnect device must be marked as such, clearly visible, directly accessible, and located within 1.8 m (6 ft) of the unit.

1.5 Moisture Probe Considerations

The M Series and Moisture Image Series probes consist of an aluminum oxide sensor mounted on a connector head. Standard probe mounts include a protective stainless steel shield.

The probe sensor materials and housing maximize durability and insure a minimum of water absorbing surfaces in the vicinity of the aluminum oxide surface. A sintered stainless steel shield is used to protect the sensor from high flow rates and particulate matter. The end cap should not be removed except upon advice from GE.

The sensor has been designed to withstand normal shock and vibration. You should make sure that the active sensor surface is never touched or allowed to come into direct contact with foreign objects, since this may adversely affect performance.

Observing these few simple precautions will result in a long and useful probe life. GE recommends that probe calibration be checked routinely, at 12-month intervals, or as recommended by our applications engineers for your particular application.

The probe will measure the water vapor pressure in its immediate vicinity; therefore, readings will be influenced by its proximity to the system walls, materials of construction, and other environmental factors.The sensor can be operated under vacuum or pressure, flowing or static conditions.

Observe the following environmental precautions.

1.5.1 Temperature Range

See section 6.9, “Probe Specifications” on page 81, for specifications.

1.5.2 Moisture Condensation

Be sure the temperature is at least 10°C higher than the dew/frost point temperature. If this condition is not maintained, moisture condensation could occur on the sensor or in the sample system, which will cause reading errors. If this happens, dry out the probe following the procedures outlined in document #916-064, *Basic GE Sensing Hygrometry Principles*.

1.5.3 Static or Dynamic Use

The sensor performs equally well in still air or where considerable flow occurs. Its small size makes it ideal for measuring moisture conditions within completely sealed containers or dry boxes. It will also perform well under gas flow conditions as high as 10,000 cm/sec and liquid flow conditions up to 10 cm/sec. Refer to document #916-064, *Basic GE Sensing Hygrometry Principles,* for maximum flow rates in gases and liquids.

1.5.4 Pressure

The moisture probe always senses the correct water vapor pressure regardless of the total ambient pressure. The moisture sensor measures water vapor under vacuum or high pressure conditions from as little as a few microns Hg to as high as 5000 psi total pressure.

1.5.5 Long-Term Storage & Operational Stability

Sensors are not affected by continuous abrupt humidity changes or damaged by exposure to saturation conditions even when stored. However, you should store probes in their original shipping containers in a clean, dry location. If the probe is saturated during storage, refer to *Moisture Condensation* on page 3 before installing the probe. For best performance, do not store probes longer than one to two years from their calibration date.

1.5.6 Freedom from Interference

The sensor is completely unaffected by the presence of a wide variety of gases or organic liquids. Large concentrations of hydrocarbon gases, Freon™, ozone, carbon dioxide, carbon monoxide, and hydrogen have no effect on sensor water vapor indications. The sensor will operate properly in a multitude of gaseous or non-conductive liquid environments.

1.5.7 Corrosive Materials

Avoid all materials that are corrosive or otherwise damaging to aluminum or aluminum oxide. These include strongly acidic or basic materials and primary amines.

1.6 Sample System Guidelines

A sample system is required for oxygen measurement and, although not mandatory, is highly recommended for moisture measurement. The purpose of a sample system is to condition or control a sample stream to within the specifications of a probe. The application requirements determine the design of the sample system. GE applications engineers will make recommendations based on the following general guidelines.

1.6.1 Moisture Sample Systems

Typically, sample systems should be kept very simple. They should contain as few components as possible and all or most of those components should be located downstream of the measurement probe. *Figure 1* below shows an example of a basic sample system consisting of an explosion-proof housing with a sample cell, a filter, a flowmeter, a vent valve and two-shut off valves, one at the inlet and one at the outlet.

The sample system components should not be made of any material that will affect measurements. A sample system may include a filter to remove particulates from the sample stream or a pressure regulator to reduce or control the pressure of the stream. However, most common filters and pressure regulators are not suitable for sample systems because they have wetted parts that may absorb or release components (such as moisture) into the sample stream. They may also allow ambient contamination to enter the sample stream. In general, you should use stainless steel material for all wetted parts. Contact GE for further instructions.

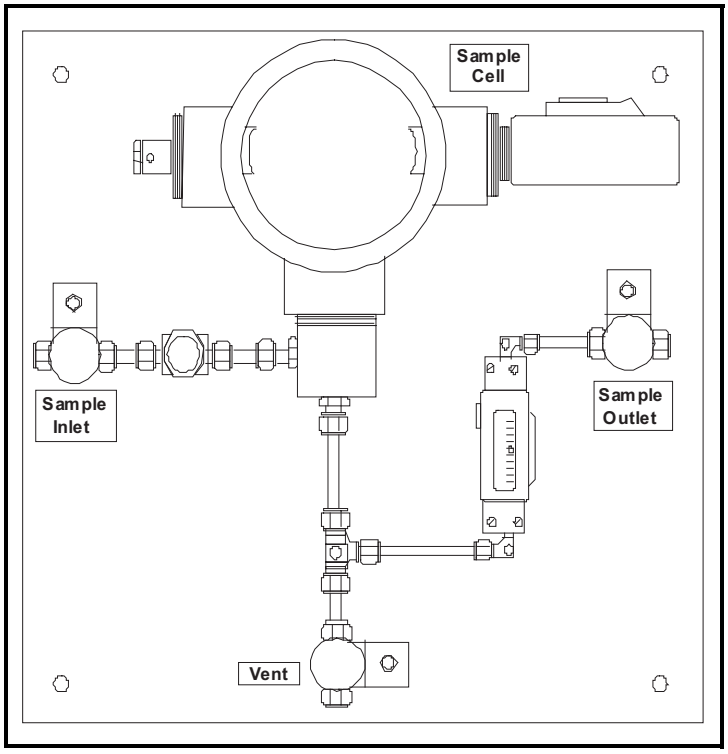

Figure 1: A Typical Moisture Sample System

Note: *The actual sample system design is dependent on the application requirements.*

1.6.2 Oxygen Sample Systems

Oxygen sample systems are required and can be ordered from GE for bench or wall mounting. You can also build your own sample system by using the following guidelines.

IMPORTANT: *The GE warranty will be voided if the sample system does not have a relief valve.*

The basic sample system requirements are as follows (see *Figure 2* below):

1. The oxygen cell requires a sample gas flow of 0.5 to 1 LPM / 1 to 2 SCFH.

2. The sample gas pressure in the cell must be between 0.0 and 1.0 psig. The pressure must not exceed 1.0 psig.

3. A 10 psig pressure relief valve installed upstream of the oxygen cell is required to prevent over-pressure.

4. A flow meter is required to measure the flow.

5. A pressure gage is required to measure the pressure.

6. A flow regulating or needle valve is required to regulate flow and should be located upstream of the cell.

7. A pressure regulator is required for sample gas supplies of 50 psig or greater.

If a sample pump is required to draw a sample to the oxygen cell, the pump should be installed downstream of the oxygen cell. You must also install a vacuum relief valve set at 1.0 psig between the oxygen cell and the pump.

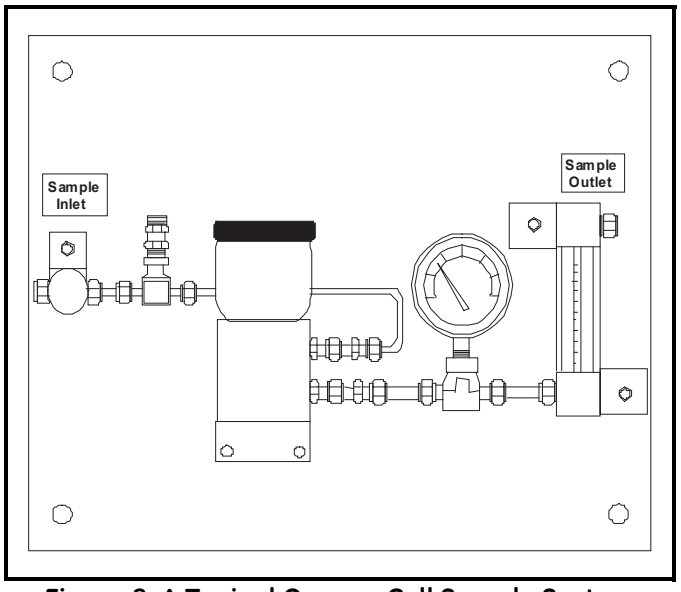

Figure 2: A Typical Oxygen Cell Sample System

Note: *The actual sample system design is dependent on the application requirements.*

1.7 Mounting the System

Mounting the hygrometer system consists of mounting the electronics unit, the probes, and the sample system(s).

1.7.1 Mounting the Electronics Unit

Use the outline and dimension drawings at the end of this chapter to mount the moisture.IQ. These drawings provide clearance and other mounting dimensions needed to prepare the site for mounting.

IMPORTANT: *If the power mains switch on the unit remains accessible to the user after installation a disconnect device is not required. However, should installation block access to the power mains switch for compliance with the EU's Low Voltage Directive (IEC 61010), this unit then requires an external power disconnect device such as a switch or circuit breaker. The disconnect device must be marked as such, clearly visible, directly accessible, and located within 1.8 m (6 ft) of the unit.*

Be sure to follow the guidelines outlined in *Choosing a Site* on page 2 before mounting the enclosure.

Note: *You may want to make connections to the MIS or M probes, Delta F Oxygen Cell, outputs and alarms before mounting the instrument if the installation location does not provide enough room for these connections to be made easily after installation.*

1.7.2 Mounting the Sample System

The sample system is normally fastened to a metal plate that has four mounting holes. GE also provides the sample system in an enclosure if requested. In either case, fasten the sample system plate or enclosure with four bolts—one in each corner. If you ordered sample system outline and dimension drawings, they will be included in your shipment.

Connect the sample system inlet and outlet to the process and return using the appropriate fittings or an appropriate NPT adapter.

CAUTION! Do not start a flow through the system until all probes and transmitters are properly installed.

1.7.3 Mounting the Oxygen Cell Assembly

If your oxygen cell is not mounted into a sample system, refer to *Figure 3* below for dimensions to mount the cell.

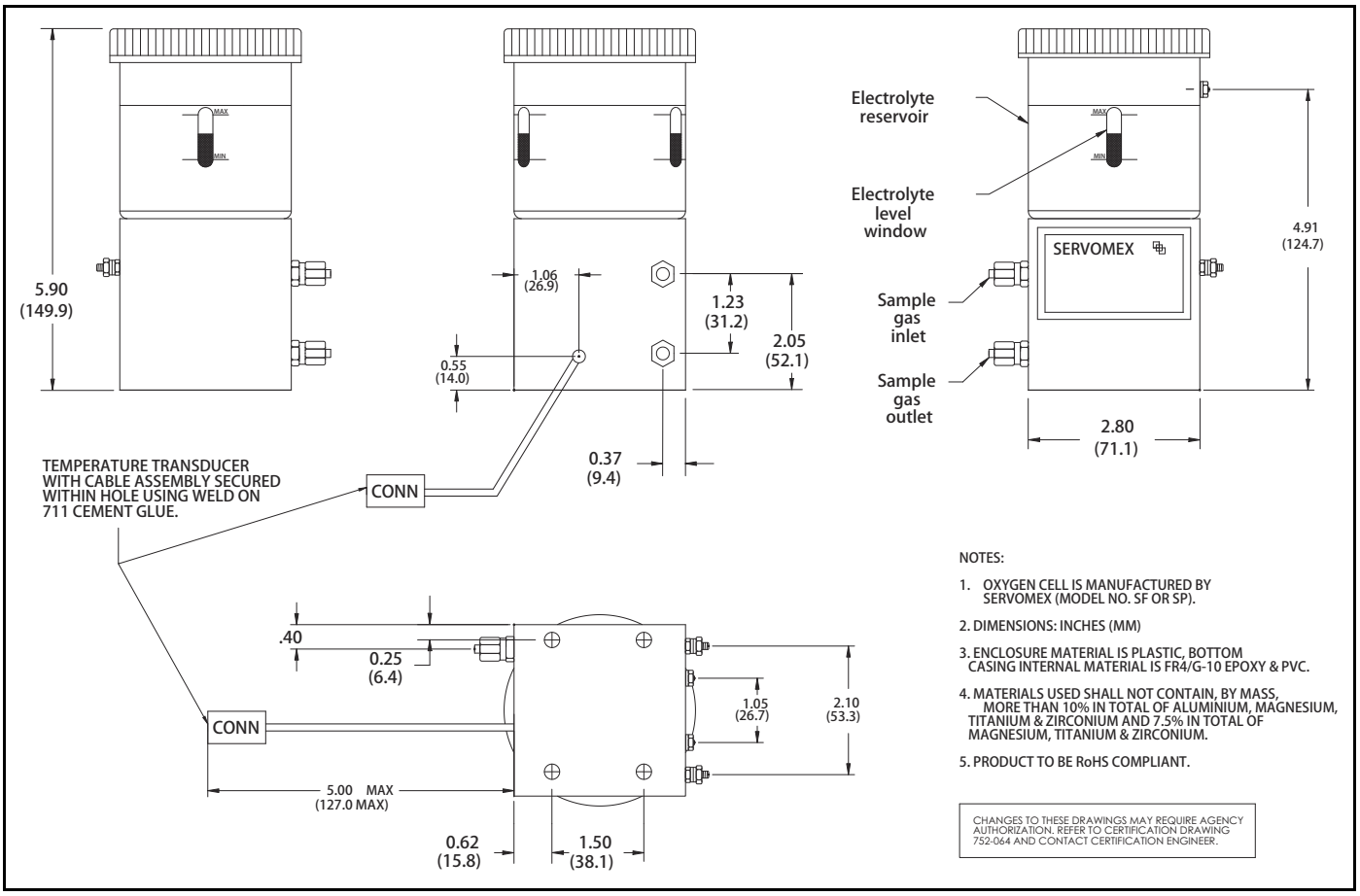

Figure 3: Oxygen Cell Dimensions

1.8 Installing the Probes

After you mount the sample system, you must insert moisture probes into the sample cells. In addition, you must check, prepare, and connect the oxygen cells (if used) to the gas line.

1.8.1 Moisture Probes

GE Moisture Image Series and M Series moisture probes have 3/4 inch-16 straight threads with an O-ring to secure probes into the sample system or directly into the process line. Other fittings are available for special applications.

CAUTION! If mounting the moisture probes directly into the process line, you must consult GE for proper installation instructions and precautions.

Moisture probes are usually installed into a sample system. The sample system protects the probes from coming into contact with damaging elements in the process. Moisture probes are installed into a cylindrical shaped container, called the sample cell, that is included as part of your sample system. (The sample cell is labeled on the sample system plate.)

To install a moisture probe that has a 3/4 inch-16 straight thread, insert it into the sample cell so it is perpendicular to the sample inlet. Screw the probe in, making sure not to cross thread it. Tighten down securely. *Figure 4* below shows a typical moisture probe orientation with the probe mounted in a GE sample cell. Install moisture probes with different fittings in the appropriate manner.

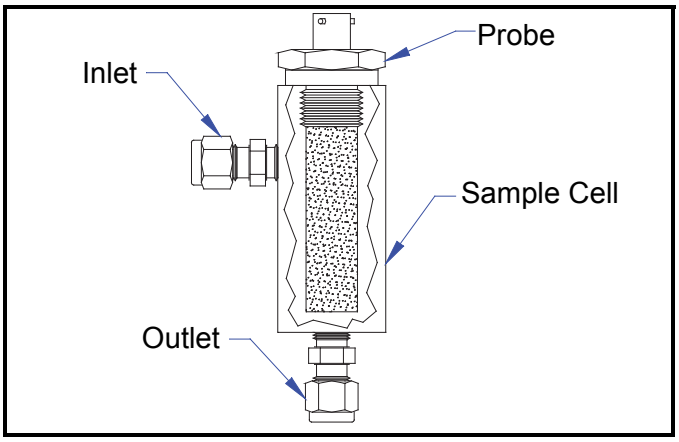

Figure 4: Moisture Probe Installed in a Sample Cell

Note: *Standard moisture probes have a sintered stainless-steel shield that protects the aluminum oxide sensor. Leave the shield in place for maximum protection.*

It is important to eliminate all leaks (whether in gas or liquid applications) for safety reasons and to be sure that measurements are not affected by ambient contamination. For gas applications, you should check for leaks using a soap bubble solution.

IMPORTANT: *Refer to the Calibration Data Sheets to connect the probes to their corresponding channels. If a probe is connected to the wrong channel, the meter will display incorrect data.*

1.8.2 Pressure Sensors

If a pressure input is required, and if the pressure is not coming from the Moisture Image Series probe, you can connect a separate pressure transmitter to an auxiliary input.

The moisture.IQ accepts any 0 to 20-mA, 4 to 20-mA, or 0 to 2-V pressure transmitters.

Always mount the pressure transmitter directly downstream of the moisture probe in order to measure the pressure at the point of the moisture measurement.

1.8.3 Delta F Oxygen Cell

Although the moisture.IQ accepts other oxygen devices as auxiliary inputs, it is designed to accept oxygen inputs directly from the Delta F Oxygen Cell. There are three steps for installing the Delta F Oxygen Cell: preparing the oxygen cell for operation, calibrating the oxygen cell, and then connecting the cell to the gas line.The Delta F Oxygen Cell is available mounted in various types of enclosures; however, the cell itself will look like the one shown in *Figure 5* below.

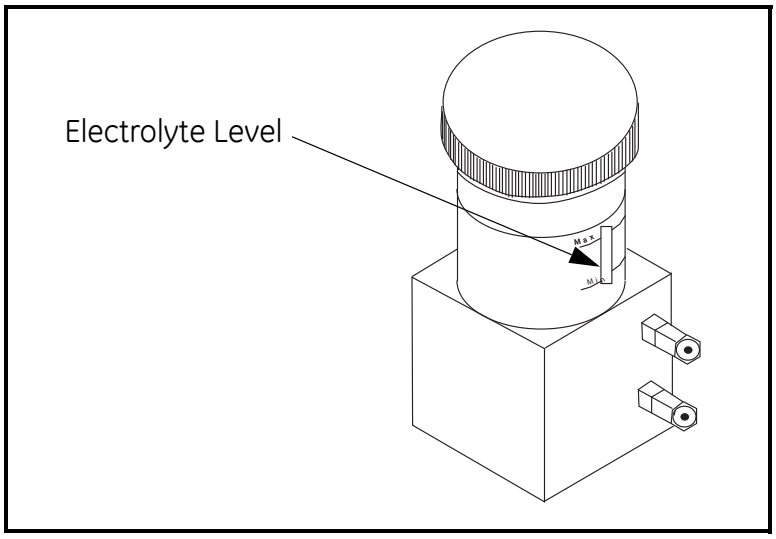

Figure 5: Delta F Oxygen Cell Drains

1.8.3a Preparing the Oxygen Cell

To prepare the oxygen cell for operation, you must fill it with the electrolyte that has been supplied in a plastic bottle.

WARNING! The electrolyte contains potassium hydroxide that is harmful if it comes in contact with eyes or skin. Consult your company safety personnel for proper procedures for handling the electrolyte.

1. Unscrew the top on the oxygen cell's reservoir.
2. Slowly add the entire contents of the bottle, approximately three ounces (90 ml), making sure not to spill any on the outside of the cell. Be especially careful that the electrolyte does not come in contact with any of the cell's electrical connections.
3. Using the min/max window on the oxygen cell, check the electrolyte level. The electrolyte should cover about 60% of the window (see Figure 5). The cell is now ready to be connected to the gas line.
4. Replace the top of the oxygen cell.

Note: *After you add the electrolyte, DO NOT add additional electrolyte to the reservoir. If the level falls below the minimum level, refer to* Checking and Replenishing the Electrolyte in the Delta F Oxygen Cell *on page 62 to replenish the cell.*

5. Calibrate the oxygen cell as described in *Calibrating the Delta F Oxygen Cell* on page 64. After you calibrate the cell, connect it to the gas line as described in the following section.

1.8.3b Connecting the Oxygen Sample System to the Gas Line

To connect the oxygen sample system to the process line, attach a 1/8 inch O. D. (outside diameter) tube to the 1/8 inch sample gas inlet fitting using a Swagelok® or equivalent mating connector. Avoid using plastic and rubber in any tubings or fittings that are included in the inlet gas lines.

CAUTION! Do not connect the oxygen cell outlet to flow restricting devices, pressure lines, or vacuum lines. Pressure differentials across the cell sensor in excess of 1 psig could be harmful or damage the cell.

If the gas being monitored does not create a safety hazard, vent it to atmosphere at the sample system outlet. If venting the gas to atmosphere causes a safety hazard, vent the gas to a safe location. Make sure the venting system does not create a back pressure to the oxygen cell.

The vented sample will not be corrosive if you install and operate the cell properly.

1.9 Making Electrical Connections

WARNING! To ensure the safe operation of this unit, you must install and operate the moisture.IQ as described in this user's manual. In addition, be sure to follow all applicable safety codes and regulations for installing electrical equipment in your area.

WARNING! Turn off the moisture.IQ before making any connections.

Make all connections to the back of the meter (see *Figure 6* below). The channels on the left are numbered Channel 1, 2 and 3, and those channels on the right are Channel 4, 5, 6.

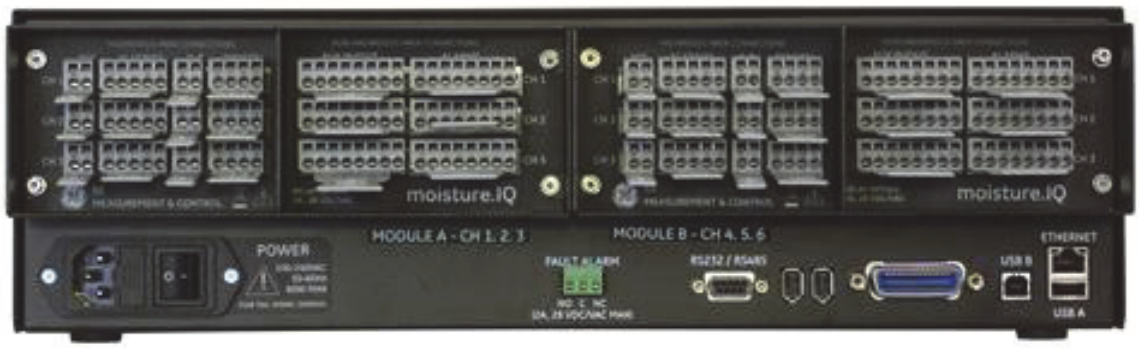

Figure 6: Rear Panel Connections

1.9.1 Using the Lever to Make Wiring Connections

Use the included levers to assist with wiring the cables to terminal block as shown in *Figure 7* below. Press and hold the lever against the terminal block and insert the wire into it. Release the lever to secure the connection.

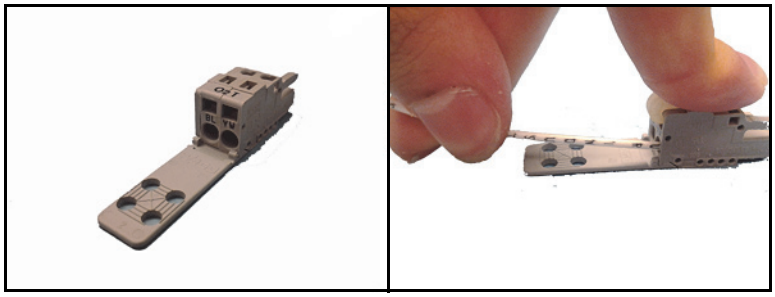

Figure 7: Using the Press Lock Lever

IMPORTANT: *To maintain good contact at each terminal block and to avoid damaging the pins on the connector, pull the connector straight off (not at an angle). Make the cable connections while the connector is away from the unit, and then push the connector straight on (not at an angle) when the wiring is complete.*

Proper connections and cabling are extremely important for accurate measurement. Use the correct cable type for each probe and make sure the cables are not damaged during installation. See the sections which follow for specific connections.

1.9.2 Connecting the Power

IMPORTANT: *If the power mains switch on the unit remains accessible to the user after installation a disconnect device is not required. However, should installation block access to the power mains switch for compliance with the EU's Low Voltage Directive (IEC 61010), this unit then requires an external power disconnect device such as a switch or circuit breaker. The disconnect device must be marked as such, clearly visible, directly accessible, and located within 1.8 m (6 ft) of the unit.*

1.9.3 Connecting Moisture Probes

The moisture.IQ uses M Series and Moisture Image Series probes to measure moisture. If you need to connect a different probe type, please contact our technical support department. If you ordered one or more M Series probe(s) with the moisture.IQ, GE has entered the necessary probe setup data on a pre-assigned channel.

IMPORTANT: *See the Calibration Data Sheets, shipped with the probes, to connect the probes to their corresponding channels. If a probe is connected to the wrong channel, the meter will display incorrect data.*

Probes are identified on the Calibration Data Sheet by a serial number. The serial number is also engraved on the hex nut of the probe. *Figure 8* below shows a probe with the serial number on the hex nut.

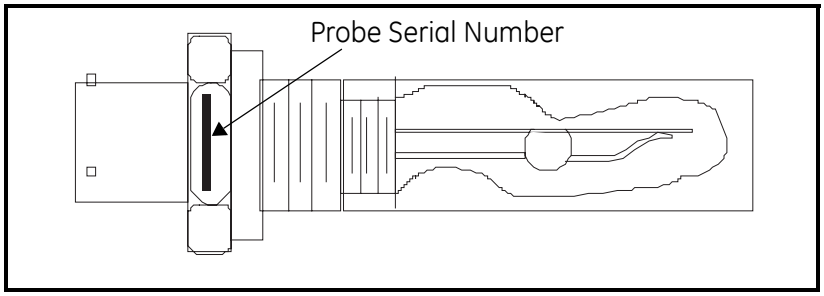

Figure 8: Moisture Probe Serial Number

The Moisture Image Series Probe does not require any preprogramming because it stores all the necessary setup data in its electronics module. Therefore, you can install the Moisture Image Series probe on any available channel. After you install the probe, you must activate the probe on the installed channel, as described in Chapter 2.

Use the following sections to properly connect probes.

1.9.3a M Series Probes

M Series probes are primarily used for moisture measurement, but can be ordered to measure temperature as well. If ordered, an optional temperature thermistor is included in the moisture probe and requires an additional connection.

If the M Series probe does not have a thermistor, then you may use a two-wire shielded cable with a bayonet-type connector to connect to the electronics unit.

If the thermistor is installed then use a four-wire shielded cable with a bayonet-type connector to connect the M Series Probe to the electronics unit.

The M Series Probe may be located up to 600 meters (2000 feet) from the moisture.IQ.

Before making electrical connections, connect the cable to the probe by inserting the bayonet-type connector onto the probe and twisting the shell clockwise until it snaps into a locked position (approximately 1/8 inch of a turn). Wire the probe cable per the wiring in *Figure 9* below. The M-Series terminal block also notes the corresponding color from the probe cable.

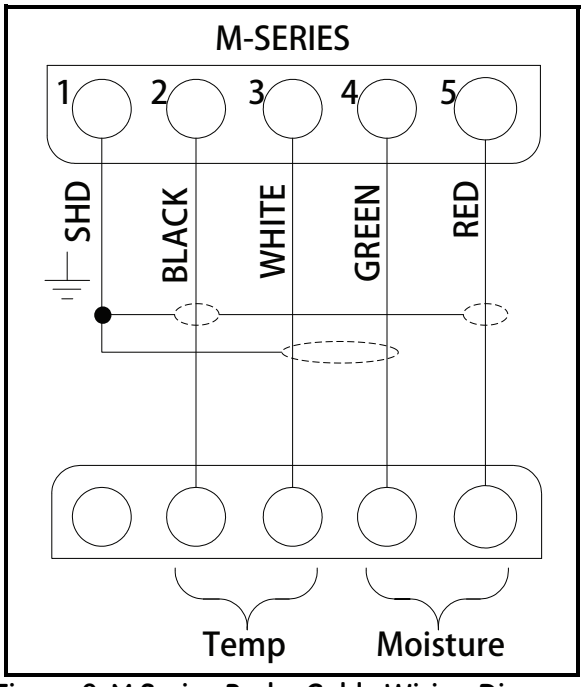

Figure 9: M Series Probe Cable Wiring Diagram

Note: *The term "SHD" on the drawing corresponds to "SH" on the connector where shield termination is described.*

1.9.3a M Series Probes (cont.)

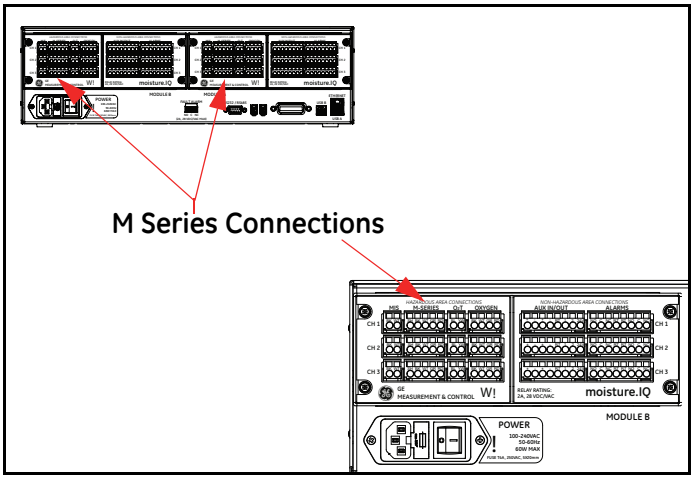

Figure 10: M Series Probe Connections

If you connect a probe to the wrong channel, you can either reconnect the probe to the assigned channel, or reconfigure the current channel as described in *Verifying and Entering Setup Data* in Chapter 2.

WARNING! The M Series probe may not be capable of withstanding the 500 V insulation. This must be taken into account in any installation in which it is used.

1.9.3b Moisture Image Series Probes (MISP/MISP2)

Connect the Moisture Image Series probes (MISP) to the moisture.IQ using the cable provided. You can locate the Moisture Image Series Probe up to 915 meters (3000 feet) from the electronics unit.

Before making any electrical connections, you must assemble the probe. The Moisture Image Series probes may be shipped in two parts: a probe and an electronics module, each of which has a serial number. Match the appropriate probe to the matching electronics module using the serial numbers that are listed on the Calibration Data Sheet. Insert the probe into the probe connector on the electronics module and turn counterclockwise (see *Figure 11* below).

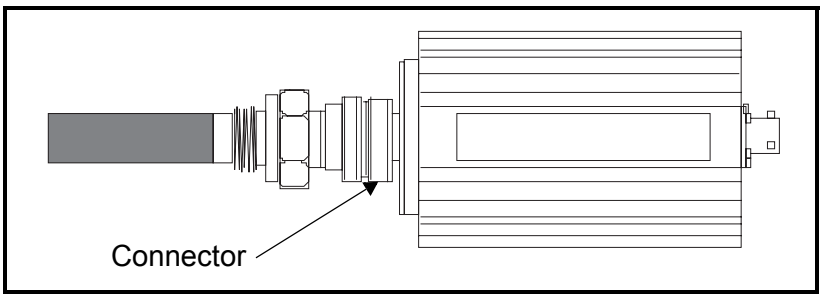

Figure 11: Moisture Image Series Probe (MISP) Assembly

CAUTION! The MISP2 probe has an integral set of electronics that are permanently attached (see *Figure 12* below). Do not attempt to separate the probe from the electronics.

Figure 12: MISP2 Probe

1.9.3b Moisture Image Series Probes (cont.)

If the Moisture Image Series probe required assembly, once the probe is assembled, connect the cable to the terminal block labeled MIS on the back panel of the electronics unit (see *Figure 13* below).

You can connect the Moisture Image Series Probe to any channel. However, if you are also using other sensors, such as the M Series probes, be sure to connect the Moisture Image Series Probe to an open channel.

IMPORTANT: *Check the Calibration Data Sheets (of all the sensors) to determine which channels already have probe assignments.*

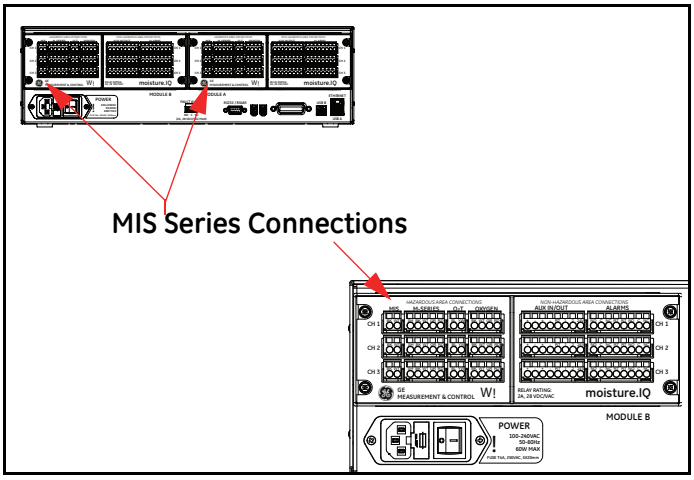

Figure 13: MIS Probe Connections

After you make the back panel connections, connect the remaining end of the probe cable to the Moisture Image Series probe (see *Figure 14* below). Once you complete connecting the Moisture Image Series Probe(s), you must activate the probe on the installed channel as described in *Activating and Changing Probes* in Chapter 2.

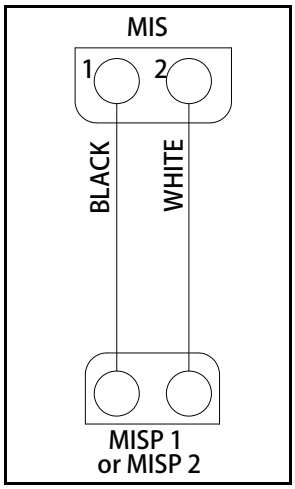

Figure 14: MIS Probe Cable Wiring Diagram

1.9.4 Connecting the Delta F Oxygen Cell

The Delta F Oxygen Cell is available in a general-purpose model with standard or VCR® fittings. The oxygen cell can also be mounted in a weatherproof enclosure (R4) for outdoor applications or an explosion-proof enclosure (R7) for hazardous areas.

CAUTION! Do not power up a moisture.IQ without establishing a flow through the Delta F Oxygen Cell (see *page 24*).

Each model of the oxygen cell has a set of sensing, secondary electrodes and optional temperature sensor. Make connections from the electrodes on the cell to the terminal block labeled OXYGEN on the back of the electronics unit (see *Figure 15* and *Figure 16 on page 20*). For proper operation, make connections to each set of electrodes using a four-wire shielded cable. GE provides 704-1357-B-Z type cable with 22 AWG leads for the Delta F oxygen cells. The cable provided also has provisions for Delta F temperature connection.

Cable error is a function of cable resistance/foot, length of cable, and maximum sensor current output. Since higher range sensors have a greater current output, they have lower acceptable cable lengths. Larger gauge cable yields longer acceptable cable lengths. Use *Table 1* below to determine acceptable installation lengths.

Table 1: Acceptable Cable Lengths for Delta F Ranges

Delta F Sensor Range	Cable Gauge	Max Length
0-50 ppm and 0-100 ppm	22 AWG	1300 ft
0-1000 ppm	22 AWG	400 ft
0-10,000 ppm and greater	22 AWG	100 ft
0-50 ppm and 0-100 ppm	20 AWG	2100 ft
0-1000 ppm	20 AWG	630 ft
0-10,000 ppm and greater	20 AWG	160 ft
0-50 ppm and 0-100 ppm	18 AWG	3300 ft
0-1000 ppm	18 AWG	1000 ft
0-10,000 ppm and greater	18 AWG	250 ft
0-50 ppm and 0-100 ppm	16 AWG	6600 ft
0-1000 ppm	16 AWG	2000 ft
0-10,000 ppm and greater	16 AWG	500 ft

1.9.4 Connecting the Delta F Oxygen Cell (cont.)

Note: *Cable with 16 AWG wire is the largest cable size that can be easily installed into the instrument terminal blocks and the Delta F sensor terminal posts.*

Instructions for connecting each type of oxygen cell are described in the following sections. If you are installing the oxygen cell in an intrinsically safe area, you should refer to the following section for special installation requirements.

WARNING! The Delta F Oxygen Cell is BASEEFA approved for use in intrinsically safe areas when connected to a BASEEFA approved moisture.IQ hygrometer. Install the apparatus so that the terminals are protected to at least the requirements of IP20. Copies of official BASEEFA documentation (certificates of compliance, licenses, etc.) are to be made in their entirety.

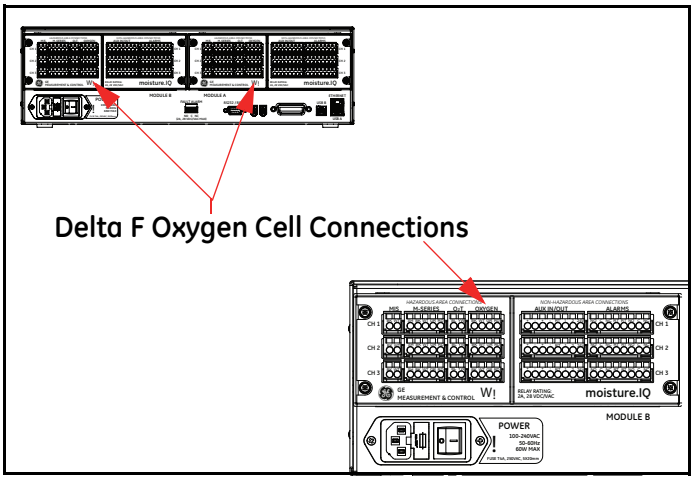

Figure 15: Delta F. Oxygen Cell Connections

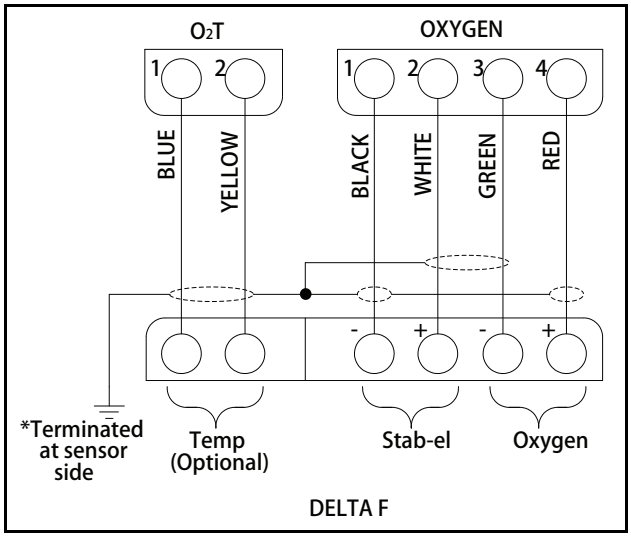

Figure 16: Delta F Wiring

1.9.4a Standard Delta F Oxygen Cells

Figure 17 below shows the standard oxygen cell and identifies the sensing and secondary electrodes. Make oxygen cell connections from the electrodes on the oxygen cell to the OXYGEN terminal block on the back of the electronics unit. Use *Table 2* below to make oxygen cell connections.

IMPORTANT: *To maintain good contact at each terminal block and to avoid damaging the pins on the connector, pull the connector straight off (not at an angle), make cable connections while the connector is away from the unit, and push the connector straight on (not at an angle) when the wiring is complete.*

Table 2: Standard Delta F Oxygen Cell Connections

Connect:	To Delta F Oxygen Cell:	To moisture.IQ OXYGEN Terminal Block
red wire	+ sensing electrode	pin 1 RD
green wire	– sensing electrode	pin 2 GR
white wire	+ secondary electrode	pin 3 WT
black wire	– secondary electrode	pin 4 BK
shield	Earth Ground Connection	---

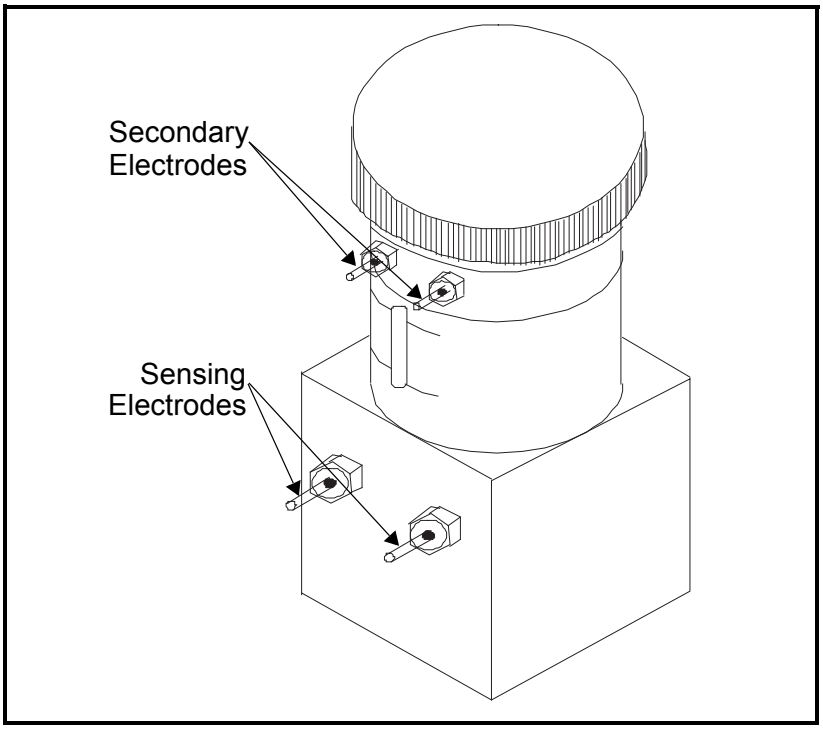

Figure 17: Standard Delta F Oxygen Cell

Note: *The temperature reading of the sensor is not applicable to the customer, but rather used for oxygen temperature compensation.*

1.9.4b Weatherproof Delta F Oxygen Cells

The weatherproof oxygen cell has a set of sensing and secondary electrodes that are wired to a terminal strip in the weatherproof enclosure. Connect the weatherproof oxygen cell using a four-wire shielded cable with a mating bayonet-type connector. Fasten the bayonet-type connector to the mating connector on the bottom of the weatherproof enclosure. Connect the other end of the cable to the OXYGEN terminal block on the back of the electronics unit as shown in *Table 3* below.

Table 3: Weatherproof Delta F Oxygen Cell Connections

Connect:	To Delta F Enclosure Terminal Block	To moisture.IQ OXYGEN Terminal Block
red wire (+)	pin 1	pin 1
green wire (–)	pin 3	pin 2
white wire (+)	pin 4	pin 3
black wire (–)	pin 5	pin 4
shield	pin 2	pin 5

1.9.4c Explosion-proof Delta F Oxygen Cells

Figure 18 on page 23 shows the explosion-proof oxygen cell. The oxygen cell has a set of sensing and secondary electrodes that are wired to a terminal strip in the explosion-proof enclosure. Connect the explosion-proof oxygen cell using a four-wire shielded cable. Connect one end of the cable to the OXYGEN terminal block on the back of the electronics unit and the other end to the terminal strip in the oxygen cell enclosure. Feed cable wires through an opening in the side of the explosion-proof enclosure. Use *Table 4* below to make oxygen cell connections.

Table 4: Explosion-proof Oxygen Cell Connections

Connect:	To Oxygen Cell Terminal Block	To moisture.IQ OXYGEN Terminal Block:
red wire (+)	pin 1	pin 1
shield	–	pin 5
green wire (–)	pin 2	pin 2
white wire (+)	pin 3	pin 3
black wire (–)	pin 4	pin 4

1.9.4c Explosion-proof Delta F Oxygen Cells (cont.)

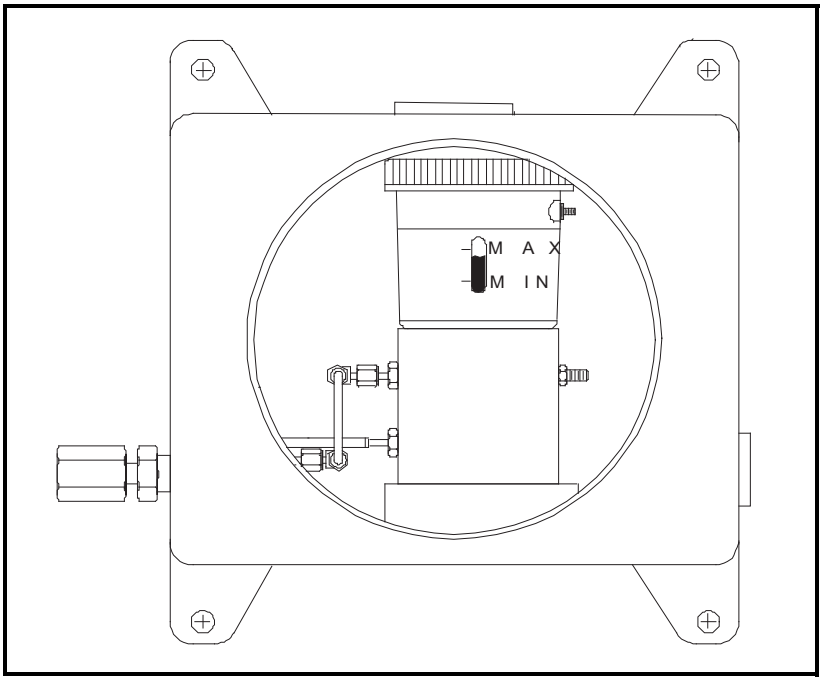

Figure 18: Explosion-proof Delta F Oxygen Cell

1.10 Establishing a Gas Flow Through the Oxygen Cell

CAUTION! Establish a gas sample flow before you power up or damage may occur to the oxygen cell.

If you are using an oxygen cell, you must establish a gas flow through the cell before powering up. If you are not using an oxygen cell, proceed to Chapter 2, *Initial Setup.*

The oxygen cell requires a flow rate of 2 to 2.5 SCFH through the cell. Oxygen cell inlet pressure should be between 0.2 and 1.0 PSIG. Refer to *Figure 19 on page 25* when establishing a gas sample flow.

CAUTION! Do not operate the Delta F oxygen cell for extended periods of time at oxygen concentrations that are over range. Trace and low percent range sensors may be damaged if exposed to high levels of oxygen, such as air, for long periods (>1 hour) while the moisture.IQ is on. If exposure is unavoidable, either disconnect the oxygen cell from the moisture.IQ or equip the sample system with a valve that allows the cell to be switched to purge gas.

Close the flow control valve and adjust the upstream pressure as required. GE recommends about 2 to 10 psig upstream of the flow control valve, depending on which valve is installed in the sample system.

To safeguard against over pressurizing the oxygen cell, install a relief valve rated at 10 psig into the gas flow system. If the pressure exceeds 10 PSIG, the relief valve will open; therefore, there should be no restrictions downstream of the oxygen cell. Use 1/4 inch tubing or larger on the oxygen cell outlet and relief valve outlet. Both outlets should vent to atmosphere if possible.

CAUTION! Do not tie the relief valve and oxygen cell outlet to a common outlet line smaller than 1/4 inch. This pressure restriction will damage the oxygen cell. In addition, a relief valve should be installed in the oxygen sample system. If either of these conditions are not met, the Delta F Oxygen Cell warranty will be voided.

1.10 Establishing a Gas Flow Through the Oxygen Cell (cont.)

Slowly open the flow control valve until the recommended flow of 2 to 2.5 SCFH is established on the flow meter.

When the proper flow is achieved, make sure the relief valve is closed by placing an object (e.g., your finger, if the gas is non-corrosive) over the relief valve vent. Cover and uncover the relief valve vent and verify that the flow meter shows no change in the flow rate. Keep the relief valve closed during operation to minimize leakage in the sample system.

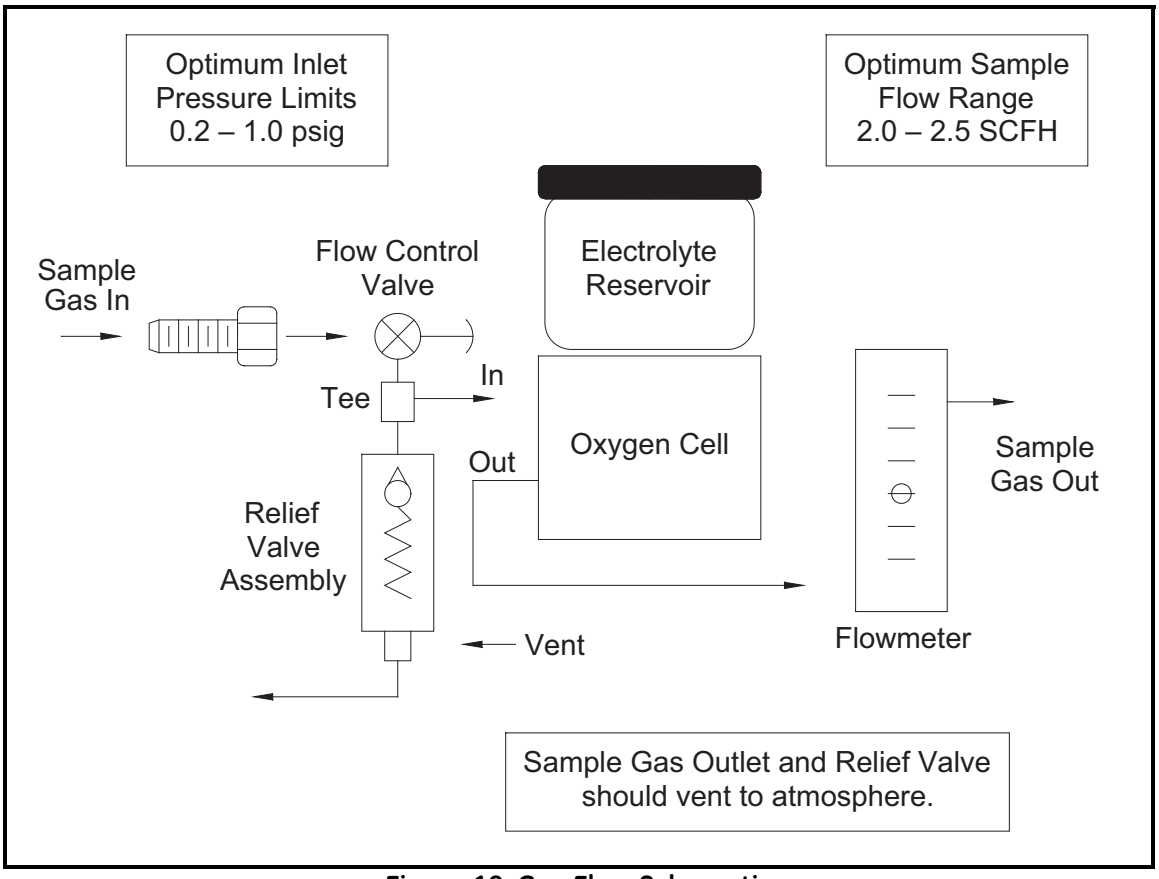

Figure 19: Gas Flow Schematic

[no content intended for this page]

Chapter 2. Initial Setup

When you first power on the moisture.IQ, the touch screen appears similar to *Figure 20* below.

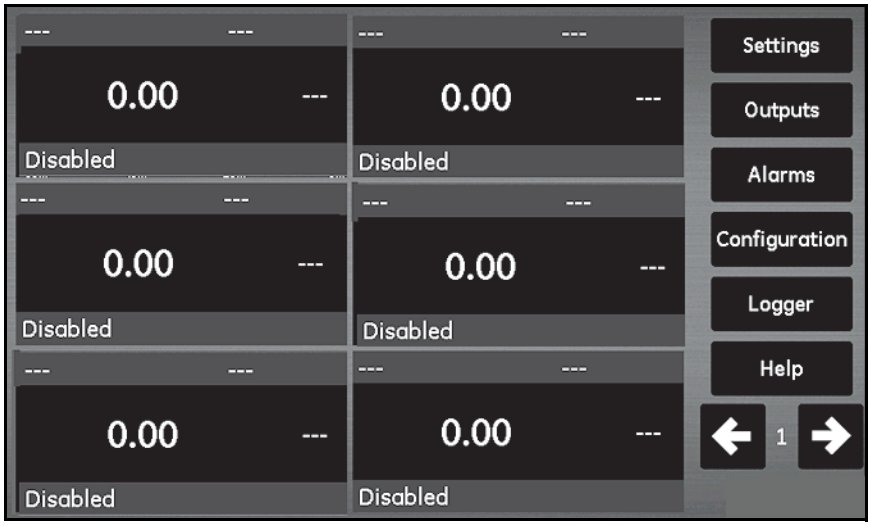

Figure 20: Main Screen

Before you can obtain useful data, you must enter needed settings and configuration data. On the touch screen, press any button on the right to enter a particular menu. Once you have entered the menu, press on the desired option.

- To enter a specific selection, press on the option, and then press on your selection in the drop-down menu.
- If an option requires alphanumeric data, press on the option, and a virtual keyboard opens, from which you can enter data. Some options (such as User Functions) supply additional keys for parameter or operation entry.
- When you have completed entering data, press the **OK** button to confirm the entry and return to the previous screen, or the **Cancel** button to exit the screen without saving the data.

On each screen, a Help button allows you to access information on that specific screen or option. A typical Help screen is shown in *Figure 21* below.

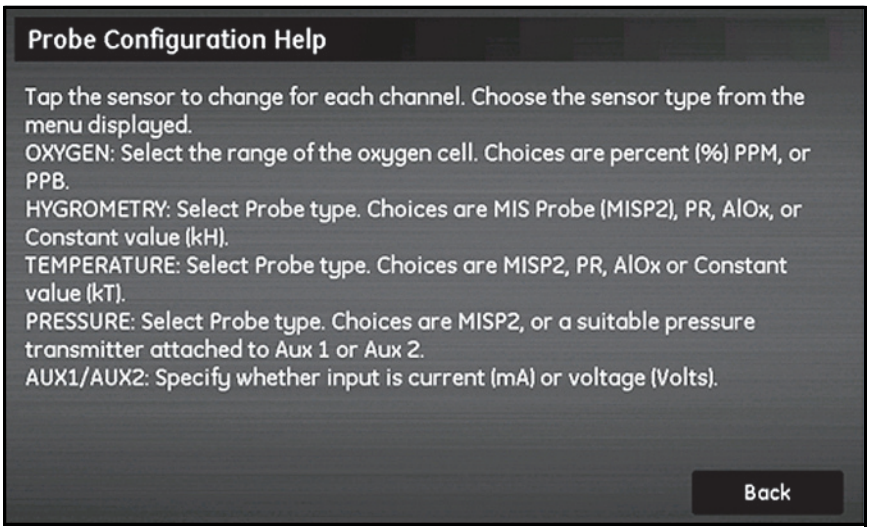
Probe Configuration Help
Tap the sensor to change for each channel. Choose the sensor type from the menu displayed.
OXYGEN: Select the range of the oxygen cell. Choices are percent (%) PPM, or PPB.
HYGROMETRY: Select Probe type. Choices are MIS Probe (MISP2), PR, AlOx, or Constant value (kH).
TEMPERATURE: Select Probe type. Choices are MISP2, PR, AlOx or Constant value (kT).
PRESSURE: Select Probe type. Choices are MISP2, or a suitable pressure transmitter attached to Aux 1 or Aux 2.
AUX1/AUX2: Specify whether input is current (mA) or voltage (Volts).
Back

Figure 21: Sample Help Screen

2.1 Entering Instrument Settings — the Settings Menu

Before you can begin measurement with the moisture.IQ, you need to set up the instrument. Press the **Settings** menu button on the main screen to access the Settings menu, which appears similar to *Figure 22* below.

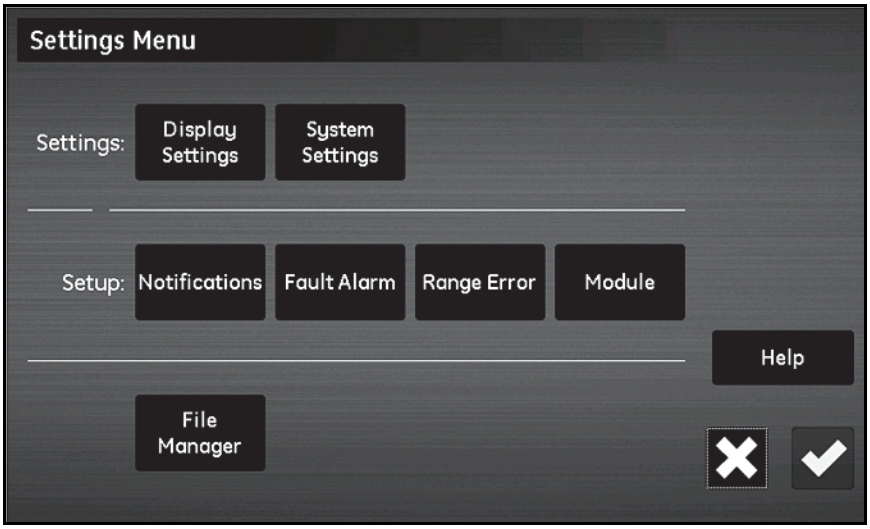

Figure 22: The Settings Menu

2.1.1 Entering System Settings

Press the **System Settings** button to enter the required date, time, volume and the formats for date, time and number display (see *Figure 23* below).

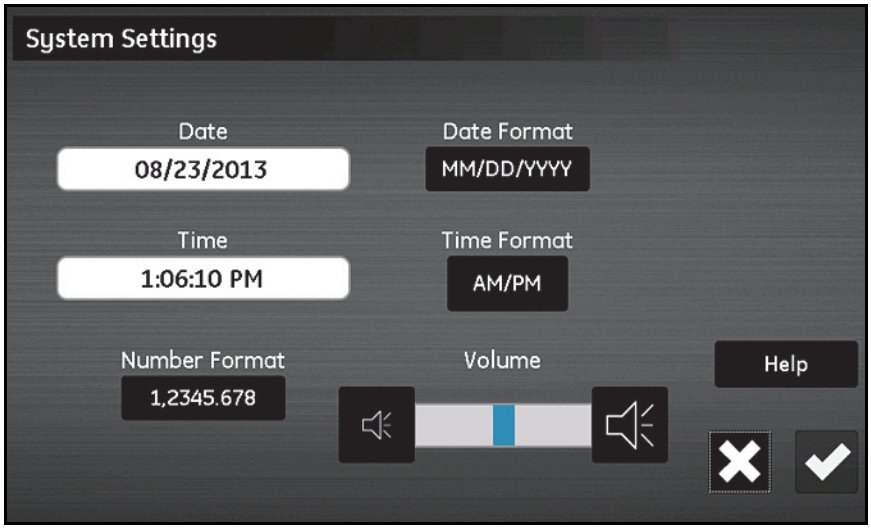

Figure 23: The System Settings Option

Press an option to open the drop-down menu or enter the data. For volume, move the slider to the desired level.

Note: *If the Number Format is set to "1.234,567" in the System Settings screen, a best-practice is not to use "Comma" for the field separator in a data log.*

2.1.2 Entering Display Settings

The Display Settings option (see *Figure 24* below) allows you to set up the appearance of the main screen.

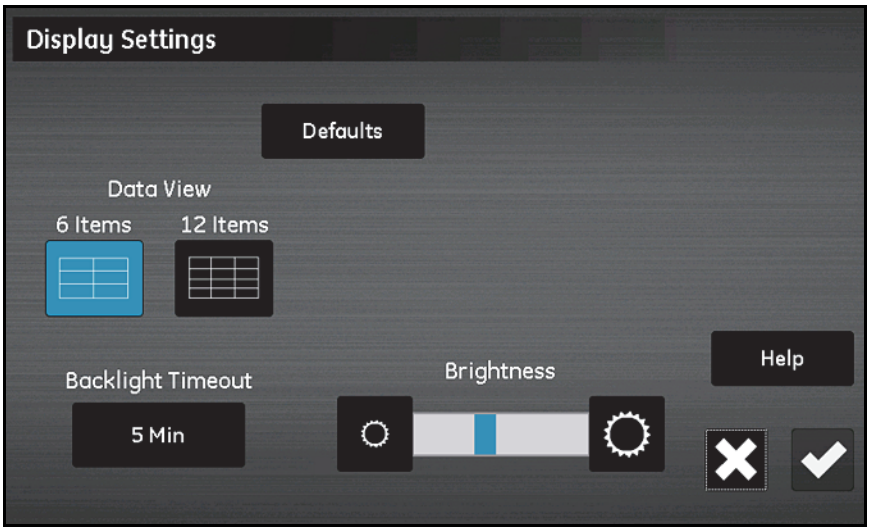

Figure 24: The Display Settings Option

- To select the number of **Data Views** (either 6 or 12), press the desired button.
- To select the number of minutes before the backlight is timed out and turns off, press the button and select the number of minutes from the drop-down menu.
- To select the screen **Brightness**, move the slider to the desired level.

2.1.3 Setting up E-mail Notifications

Note: *This feature is not available with the initial release.*

If you need to set up e-mail notifications to specific individuals for failure events or calibration reminders, press the **Notifications** button to open a screen similar to *Figure 25* below.

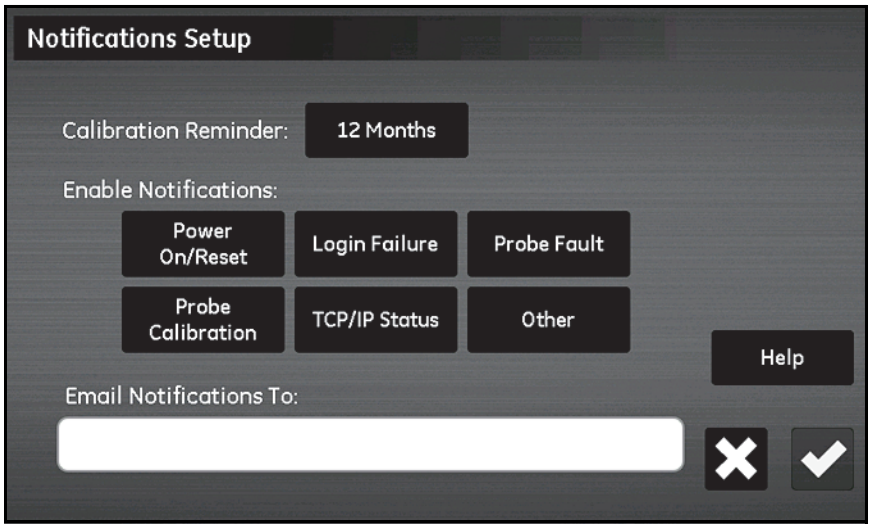

Figure 25: Notifications Setup

You can then set up a **Calibration Reminder** at a specified interval from 3 to 24 months, along with notifications for six event types:

- Power On/Reset
- Login Failure
- Probe Fault
- Probe Calibration
- TCP/IP Status
- Other

Press the **E-mail Notifications To:** window and use the virtual keyboard to enter the e-mail address to which these notifications should be sent.

2.1.4 Setting Up the Fault Alarm

A fault alarm trips under the following fault conditions:

- Power Failure
- Range Error (Configurable)
- System Reset
- System Over Temperature

In the **Fault Alarm Setup** window, (see *Figure 26* below) press the button in the grid for a given measurement type and channel to turn the alarm **On**. When you have set up the alarms, toggle the button in the upper left to **Energize** or **De-energize** all alarms.

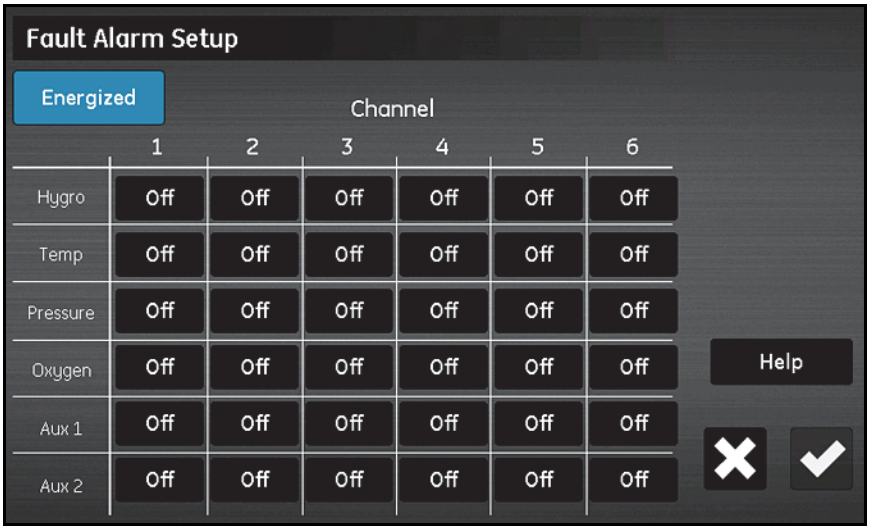

Figure 26: Fault Alarm Setup

2.1.5 Setting up Range Errors

Range Errors occur when an input signal that is within the capacity of the analyzer exceeds the calibration range of the probe. The moisture.IQ displays Range Errors with an Over Range or Under Range message.The error condition extends to all displayed measurements of that mode. For example, if dew point displays **Over Range**, then moisture in ppMv will also display **Over Range.**

In addition, since several moisture modes (such as %RH, ppMv, ppMw, and MMSCF) are dependent on more than one input to calculate their results, some modes can generate an error opposite to the initial error. For example, %RH is dependent on moisture and temperature. The nature of the %RH calculation is such that low temperatures result in a high %RH. Therefore, it is possible for temperature to read **Under Range** while %RH reads **Over Range**.

If multiple Range Errors occur simultaneously, the meter responds to them in the following order:

1. Oxygen Errors
2. Moisture Errors
3. Temperature Errors
4. Pressure Errors

In the **Range Error Setup** window (see *Figure 27* below), press the Alarm or Output for the Under Range or Over Range control. The alarm selections are **Ignore, Trip Energize,** and **Reset De-energize**. For outputs, the selections are **Ignore, Hold Last Value,** and **3.2 mA**.

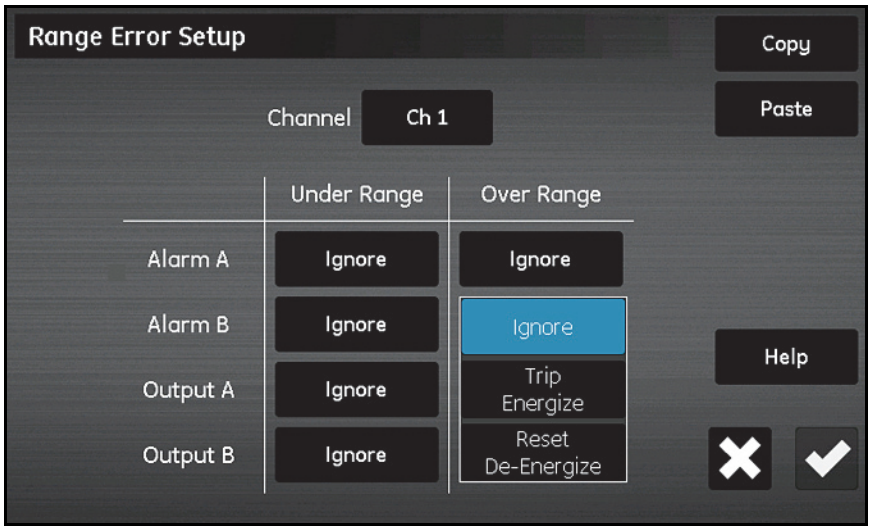

Figure 27: Range Error Setup

2.1.6 Setting up the Sensor Modules

The Module Setup window (see *Figure 28* below) enables you to verify that the modules are properly configured. When you open this screen, it displays the module serial number and number of channels available.

Note: *This screen is not editable.*

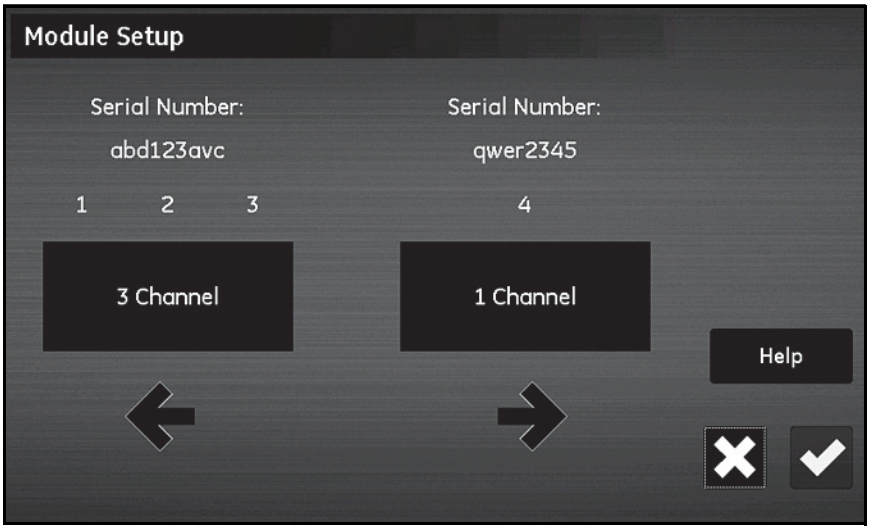

Figure 28: Module Setup

2.1.7 Creating and Saving Backup Files — the File Manager

The File Manager screen (see *Figure 29* below) enables you to keep an Excel-based record of moisture.IQ operation for backup and troubleshooting, both within the meter and saved to a USB stick. Here the most current file is always "moistureIQ.xml", while the previous file is "moistureIQ.xml.backup".

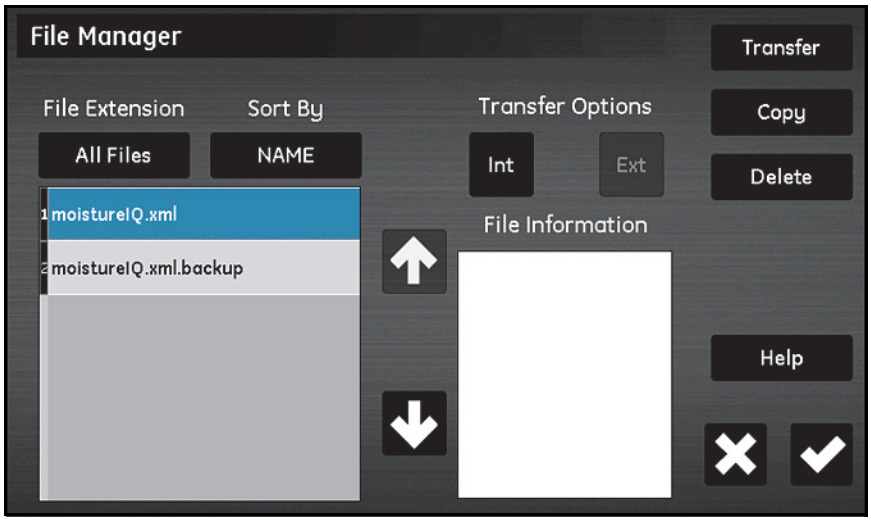

Figure 29: The File Manager

From the File Extension screen, you can view **All Files, Log Files**, or **Text Files**, and sort by **Name, Date** or **Size**.A window to the right supplies information on the highlighted file. After you have selected the file, press **Int** or **Ext** to set up the **Transfer Options** (to an internal file or an external USB stick). The buttons in the upper right allow you to **Delete** a file altogether, **Copy** it to another location, or **Transfer** it to another location.

2.2 Configuring and Setting up the Probes

After establishing the meter settings, you must configure and calibrate the attached probes. Although the probes are physically connected to the back of the electronics unit, you must "tell" the moisture.IQ what type of measurements you need the probe to make. In addition, if you want to use a constant value rather than a live input, or apply a user function, you must program the moisture.IQ accordingly. If you do not activate probes, or if you activate them incorrectly, the meter will display **No Probe** or other error messages.

Press the **Configuration** button on the main screen to open the Configuration menu (see *Figure 30* below).

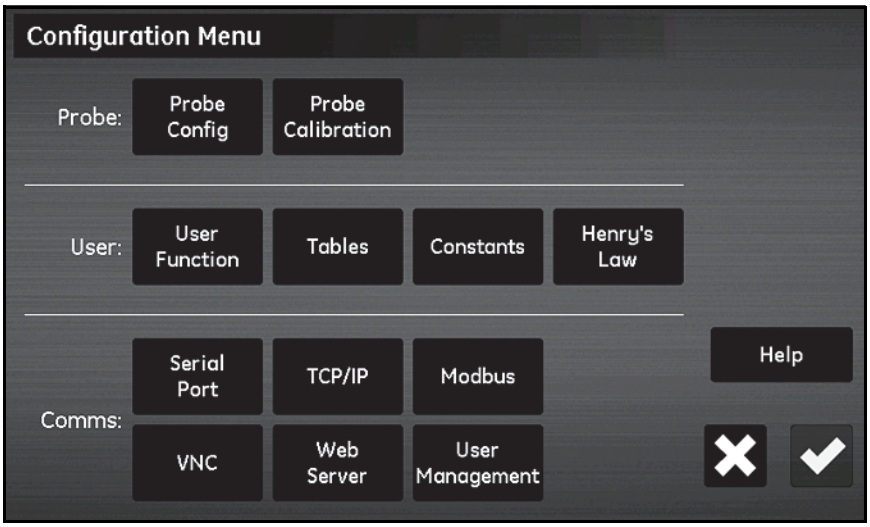

Figure 30: Configuration Menu

2.2.1 Configuring the Probes

Press the **Probe Config** button to open the Probe Configuration option (see *Figure 31* below).

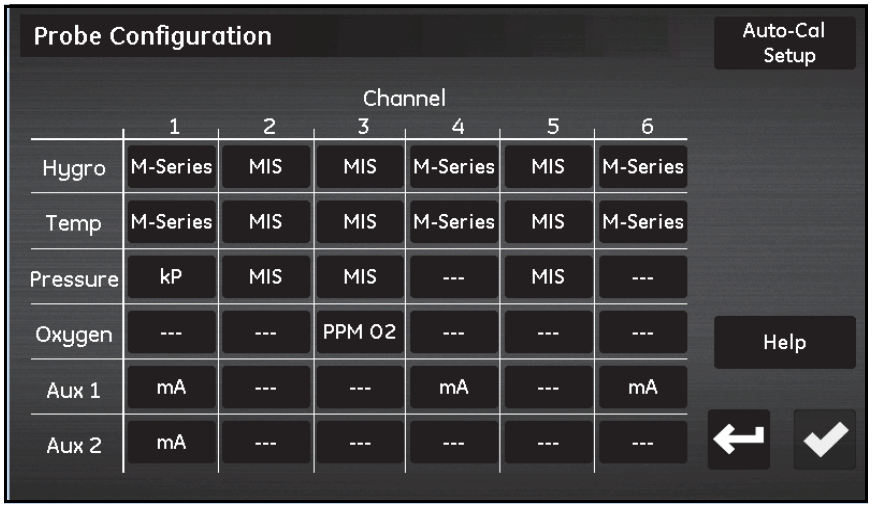

Figure 31: Probe Configuration Option

You can either scan the moisture.IQ to determine which probes are attached, or manually enter the probe on each channel. The selections are:

- For Hygro: **—** (none), M Series, **MISP,** or **kH** (constant dew point).
- For Temp: – (none), M Series, **MISP,** or **kT** (constant temperature).
- For Pressure: – (none), **MISP, Aux1, Aux 2,** or **kP** (constant pressure)
- For Oxygen: – (none), **%** (Percent), **PPM O2** (Parts per Million), **PPB O2**(Parts per Billion)
- For Auxiliary: — (none), **mA** (current), **Volts** (voltage)

If you are manually entering the probes, press on the appropriate probe(s) for each channel used. *Table 5 on page 38* lists the available measurement modes and units.

2.2.1 Configuring the Probes (cont.)

Table 5: Measurement Modes and Units for the moisture.IQ

Selected Measurement Mode	Unit Description	Displayed Measurement Mode	Displayed Units
Oxygen	% = Percent Oxygen (default)	Oxygen	%
	PPM = Parts Per Million	Oxygen	PPM
	PPB = Parts Per Billion	Oxygen	PPB
	µ = Microamps (Diagnostic Mode)	Oxygen	µ
Hygrometry	DP ° = Dew/Frost Point Degrees Celsius (default)	Dew Point	°
	DP ° = Dew/Frost Point Temperature Fahrenheit	Dew Point	°
	PPMv = Parts per Million of Water by Volume	H_2O	PPMv
	PPBv = Parts per Billion of Water by Volume	H_2O	PPBv
	PPMw = Parts per Million of Water by Weight	H_2O	PPMw
	RH % = Relative Humidity	Rel. Humidity	%
	MMSCFig = Pounds of Water per Million Std. Cubic Feet in Ideal Gas	H_2O/MMSCFig	Lbs
	MMSCFng = Pounds of Water per Million Std. Cubic Feet in Natural Gas	H_2O/MMSCFng	Lbs
	Equiv DP° NG = Equivalent Dew/Frost Point Degrees Celsius in Natural Gas	Equiv DP	°
	Equiv DP° NG = Equivalent Dew/Frost Point Degrees Fahrenheit in Natural Gas	Equiv DP	°
	PPMv/ng = Parts Per Million by Volume in Natural Gas	H_2O/Natural Gas	PPMv
	g/m^3 = grams per meter cubed	Hygro	g/m^3
	mg/m^3 = milligrams per meter cubed	Hygro	mg/m^3
	Pw/kPa = Vapor Pressure in KiloPascals	Vapor Pressure	kPa
	Pw/mmHg = Vapor Pressure in Mercury	Vapor Pressure	mmHg
	MH = MH* (Diagnostic Mode)	H_2O	MH
	FH = FH* (Diagnostic Mode)	H_2O	FH
Temperature	° = Degrees Celsius (default)	Temperature	°
	° = Degrees Fahrenheit	Temperature	°
	Kelvin = Kelvin	Temperature	K
	° = Degrees Rankine	Temperature	°
Pressure	kPa = KiloPascal (default)	Pressure	kPa
	mPa = MegaPascal	Pressure	MPa
	Pa = Pascal	Pressure	Pa
	Barg = Bars Gauge	Pressure	Barg

Table 5: Measurement Modes and Units for the moisture.IQ (cont.)

Selected Measurement Mode	Unit Description	Displayed Measurement Mode	Displayed Units
	ATM = atmospheres	Pressure	ATM
	PSIa = Pounds per Square Inch Absolute	Pressure	PSIa
	PSIg = Pounds per Square Inch Gauge	Pressure	PSIg
	mmHg = Millimeters of Mercury	Pressure	mmHg
Auxiliary 1	mA = Milliamps (default)	Aux1	mA
	V = Volts	Aux1	V
	Scaled = scale defined by the user in the calibration menu	Aux1	Scaled
Auxiliary 2	mA = Milliamps (default)	Aux1	mA
	V = Volts	Aux1	V
	Scaled = scale defined by the user in the calibration menu	Aux1	Scaled
User	Func1-6 = User defined functions for each channel	TBD	TBD
*The MH and FH values are the moisture sensors' response values and are the values that are recorded during calibration.			

2.2.2 Calibrating the Probes

For newly-purchased moisture.IQ systems that included the purchase of moisture and/or oxygen sensors, GE has already entered calibration data; however, you should verify this data before startup. You will also need to enter calibration data if you:

- use a probe from your stock,
- will attach a transmitter to the auxiliary inputs

Be sure you have the **Calibration Data Sheets** that are supplied with each GE probe. Each Calibration Data Sheet consists of a list of data points that you will need to enter or verify. Each Calibration Data Sheet lists its corresponding probe serial number, as well as the preassigned channel number. Calibration Data Sheets are usually packed inside the probe cases.

Note: *For hygrometry, you need to enter calibration data only for M Series probes. It is not necessary to enter calibration data for the Moisture Image Series Probe unless you send the probe back to GE for calibration without its electronics module. If this is the case, enter the calibration data for the recalibrated probe as described in this section. The moisture.IQ will automatically download the new calibration data into the Moisture Image Series Probe electronics module.*

From the Calibration Menu, press the **Probe Calibration** button. The Probe Calibration window appears similar to *Figure 32* below.

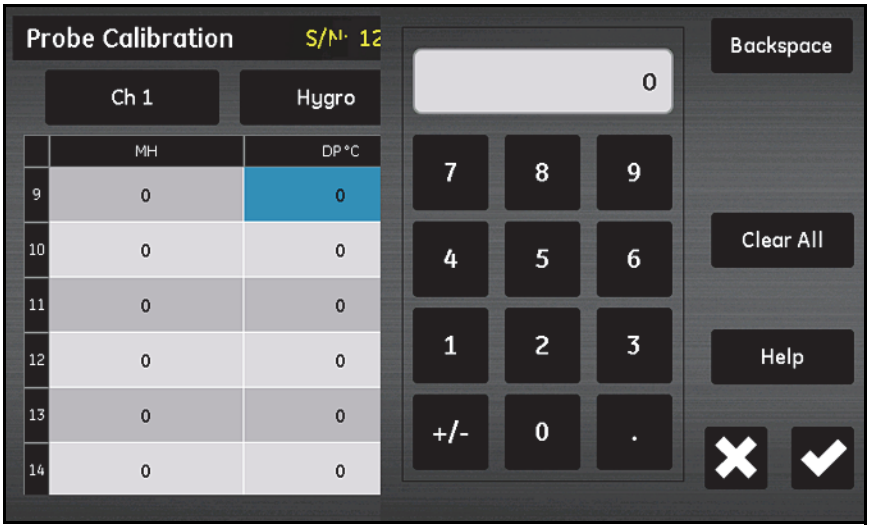

Figure 32: Probe Calibration Option

2.2.2 Calibrating the Probes (cont.)

Press the **Ch1** button to select the channel you need to calibrate; then press the **Hygro** button to select the type of input (**Hygro, Pressure, Oxygen, Auxiliary 1** or **2**, or **Function**). For each input, the table at the left opens with from 2 to 16 data points. Three keys appear to the right: **Edit Value, Insert Row** and **Remove Row**. Use the two row keys to organize the table as needed.

To enter values for the inputs, press **Edit Value**, and then press a text box and enter the values from the relevant data sheet for each point specified, using the calculator keys to the right as shown above. Continue entering or checking values for each input until you have finished with each channel.

Note: *To enter data values for Function, you must first create a User Function, as discussed on the next page.*

2.2.3 Entering User Functions

User functions enable operators to program up to four mathematical equations on each channel. They can also use any parameter on any channel to calculate a different parameter. To enter a user function, press **User Function** on the Configuration menu. The User Function Setup window appears similar to *Figure 33* below.

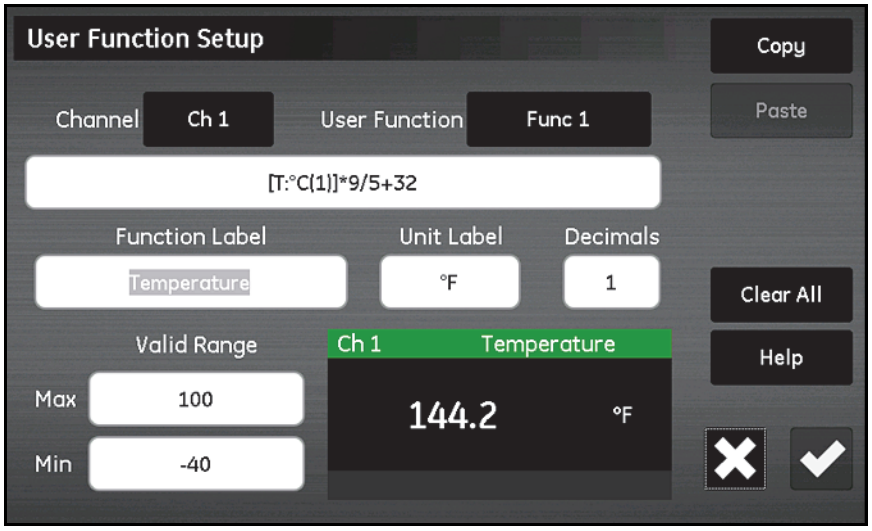

Figure 33: User Function Setup Window

Press the **Channel** button to select the channel where the function will be applied. To label the **Function** and **Unit**, press the text box for each label and use the keyboard to enter the label. Then press the **Max** and **Min** text boxes to enter the **Valid Range** for the function in digits from the keypad.

2.2.3 Entering User Functions (cont.)

To enter the actual function, press on the function (1, 2, 3, or 4) from the **User Function** drop down list. A window similar to *Figure 34* below opens.

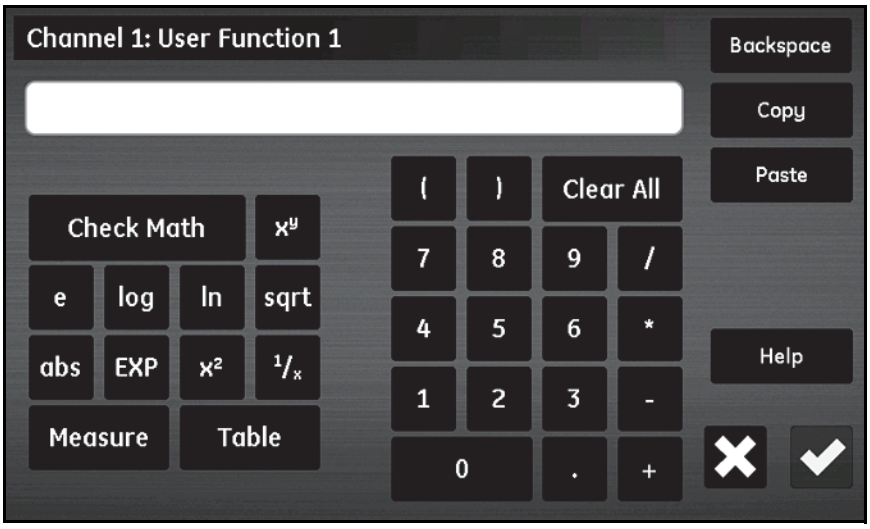

Figure 34: Equation Window

To enter a particular measured parameter into the equation, press the **Measure** button at the bottom left. A third window opens, in which you select the **Channel, Measurement Mode** and **Unit**.

To enter a table, press the **Table** button. You can then apply from the list of tables (A through F) that you have preprogrammed in the **User Tables** window (see the next page).

Press the operation or digit keys to complete entering the equation. To remove a symbol or digit, press **Backspace**. You can also **Copy** or **Paste** part or all of the equation. To check the equation, press the **Check Math** button. If the equation contains an error, an explanation appears in red at the top of the screen.

2.2.4 Entering User-Defined Tables

To support user-defined functions, the moisture.IQ can hold up to six tables (designated as A through F) of non-linear or empirical data. Users can enter up to 16 X-Y pairs in each table. The user functions can supply an X value with Tbl(). The meter then interpolates the Y value for a given X, and substitutes it for Tbl (X) in the function. (The results are extrapolated if the X value exceeds the bounds of the table.)

From the Configuration menu, press **Tables**. The User Table Setup window appears similar to *Figure 35* below.

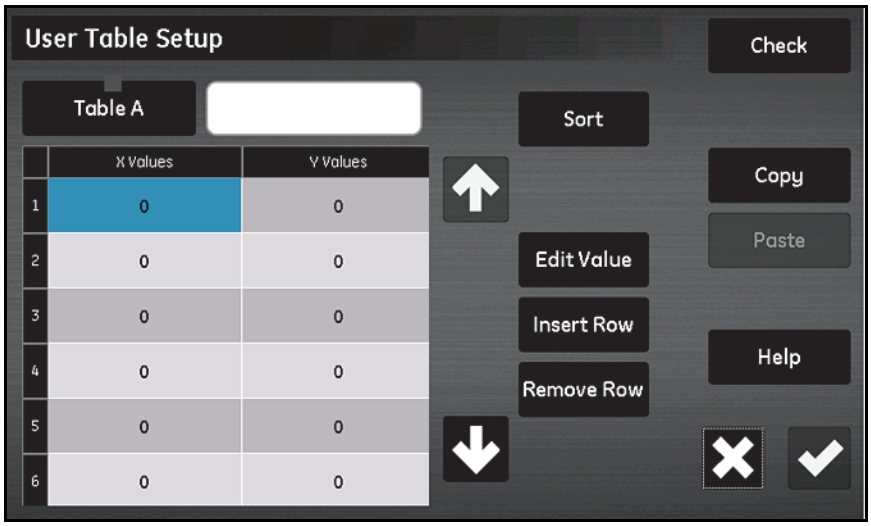

Figure 35: User Table Setup

To enter a table name different from A through F, press the text box to the right of the table name, and use the keyboard to enter the desired name. For each table, the table at the left opens with from 2 to 10 data points. Three keys appear to the right: **Edit Value, Insert Row** and **Remove Row**. Use the two row keys to organize the table as needed.

To enter table values, press **Edit Value**, and then press a text box and enter the values for each point specified, using the calculator keys that replace the three keys at the right. Continue entering or checking values for each row until you have finished with each table.

2.2.5 Entering User Constants

The User Constant option enables you to enter constants for moisture (Kh), temperature (Kt), and pressure (Kp). In addition, you can multiply the ppmv value by a specified constant for special purposes. The default multiplier is 1.000.

Note: *In order for the constant to work properly, you should make sure you also configure that channel for a constant as described on page 43.*

From the Configuration menu, press **User Constants.** The User Constant option appears similar to *Figure 36* below.

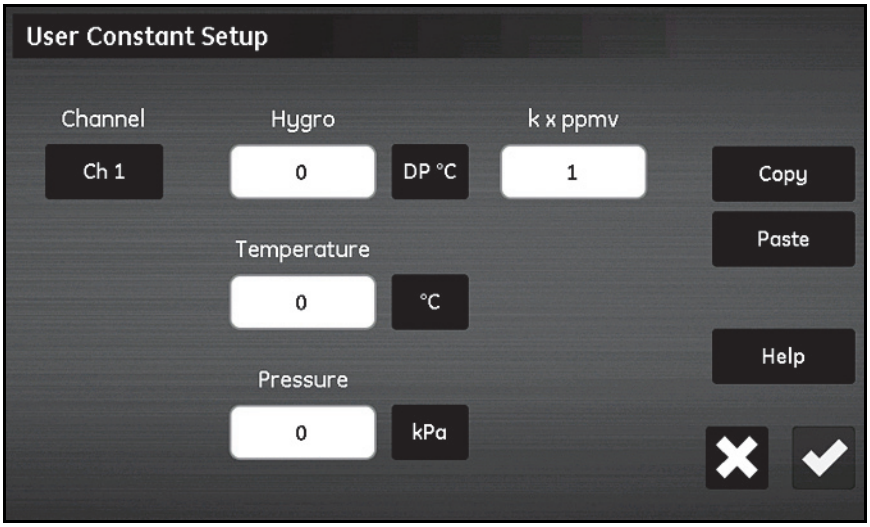

Figure 36: User Constant Window

Press the **Channel** button to select the channel for the constant. For each constant, press the text box to enter the value via screen keypad, and then press the button alongside each box to select the appropriate **Unit.**

2.2.6 Entering Saturation Constants for Moisture Measurement in Liquid Hydrocarbons

Henry's Law is applicable to ppmw moisture measurements in all organic liquids. Henry's Law states, *"At a constant temperature, the amount of a given gas that dissolves in a given type and volume of liquid is directly proportional to the partial pressure of that gas in equilibrium with that liquid."* To calculate ppmw moisture with moisture.IQ, saturation values (Cs) for the liquid stream must be entered in Cs Table, as shown in *Figure 37* below.

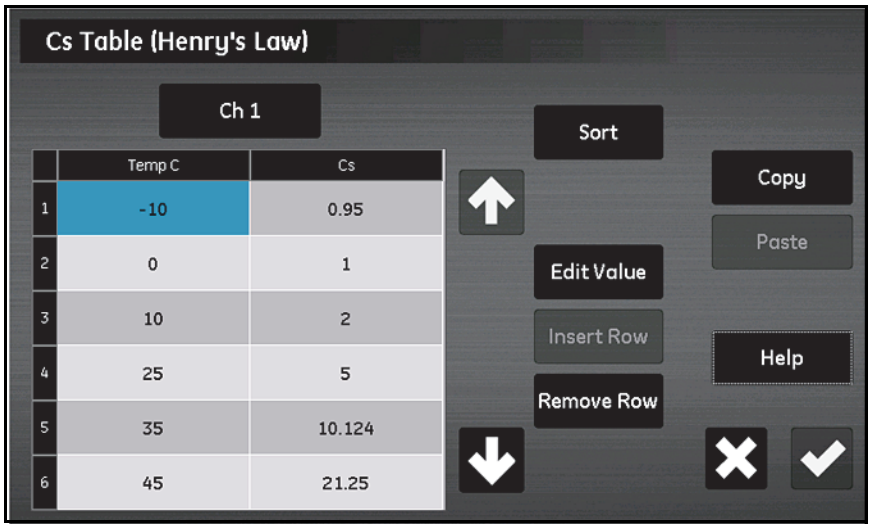

Figure 37: Cs Table for Henry's Law

Three keys appear to the right: **Edit Value, Insert Row** and **Remove Row**. Use the two row keys to organize the table as needed.

To enter table values, press **Edit Value**, and then press a text box and enter the values for the temperature (degrees Centigrade) and corresponding constant value, using the calculator keys that replace the three keys at the right. Continue entering or checking values for each row until you have finished.

2.2.7 Setting up moisture.IQ Communications

The **Comms** submenu in the Configuration menu enables you to enter settings for five different communications types: **Serial Port, TCP/IP, Modbus, VNC** and **Web Server.** A sixth option, **User Management**, allows you to set up and control access for Web Server users. Press the button for the designated communication option to enter parameters.

- For Serial Port, the needed entries are **Mode** (RS-232 or RS-485), **Word Size** (7 or 8 bits), **Stop Bits** (1 or 2), **Baud Rate** (9600 to 115,200), **Parity** (Odd or Even), **Tx** and **Rx.** The **Test Comm** button allows you to test the setup.
- For TCP/IP, you can press to disable or enable the **LAN Access**. If this access is disabled, you can press **Automatic** to obtain the **IP Address** and **DNS**. See "Connecting to an Ethernet LAN" on page 55.
- For Modbus, you can disable or enable **Modbus/RTU** and **Modbus/TCP**. If these parameters are disabled, you can enter the **Slave Address** (for RTU) or the **Port** (for TCP) via the screen keypad.
- For VNC, you can enable or disable the **VNC Server**, and then view the **Port** and **Password**, as well as the source of the **Connections.**
- For Web Server, you can enable or disable the **Web Server** and the **SSL** (or password), and view the **Port.** You can also allow access to:
  - **Readings**
  - **System Status**
  - **Remote Access**
  - **Read Logs**
  - **Delete Logs**
  - **Other**

2.2.7 Setting up moisture.IQ Communications (cont.)

- To enter the User Management option, you must first enter an administrator password. *See "The Admin Account" on page 57.* The window then appears similar to *Figure 38* below.

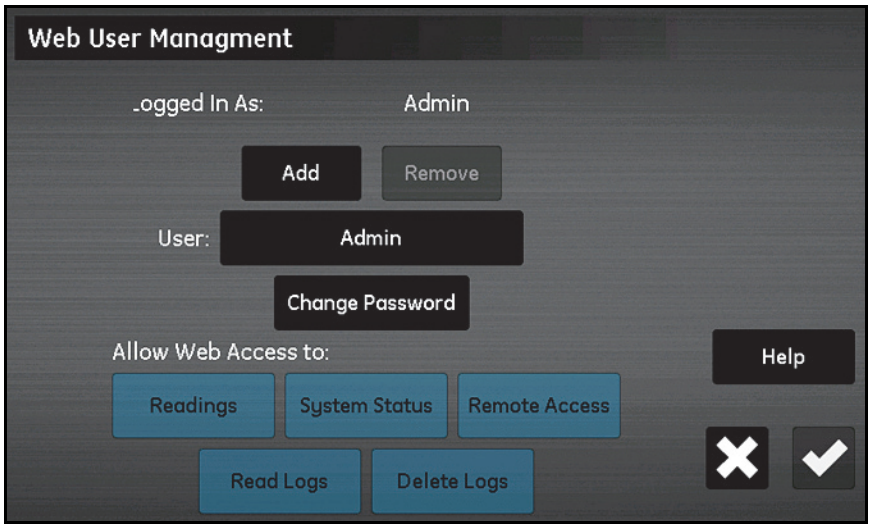

Figure 38: Web User Management

In this window, you can add or remove users, and allow their access to five options:

- Readings
- System Status
- Remote Access
- Read Logs
- Delete Logs.

2.3 Entering Outputs and Alarms

Before you begin measurement, you can also set up the outputs and alarms.

2.3.1 Setting up the Outputs

From the main screen, press the **Outputs** button. The window appears similar to *Figure 39* below.

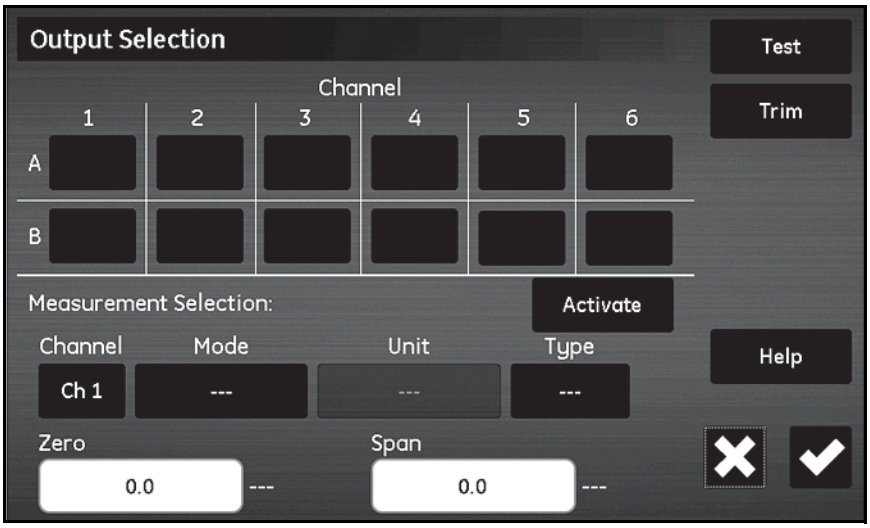

Figure 39: The Outputs Option

1. First, press on the desired **Channel** and **Output** (**A** or **B**).
2. Then go down to the Measurement Selection section and press the measurement **Mode, Unit** and **Type** you need. (For available modes and units, refer to *Table 5 on page 38*.)
3. Press the Zero box and enter the zero value via the keypad. Repeat this procedure for the Span value.

2.3.2 Testing the Output

Make sure the output(s) are connected to the moisture.IQ as shown in Chapter 1, and use the following steps to perform a test:

1. Use the arrow keys to move the pointer to the channel and output you want to test.
2. Enter a percentage between 0 and 125 to test.

Note: *If you do not enter a new value, the moisture.IQ defaults to the previously entered value.*

The output should change to the appropriate value.

Note: *The output depends on the output range (0-20 mA, 4-20 mA, 0-2 V).*

3. Repeat steps 1 through 3 for each channel and output you want to test.

2.3.3 Trimming Outputs

The measured value of the outputs can vary from the programmed value due to load resistance tolerance (e.g., display, computer interface, etc.). The Outputs option provides a trimming feature you can use to compensate for any variation in the recorder outputs.

To accurately trim the outputs, you will need a digital multimeter capable of measuring 0 to 2-V with a resolution of ±0.0001 VDC (0.1 mV) or 0 to 20-mA with a resolution of ±0.01 mA. (The range you use depends on your output.) Most good quality 3 1/2-digit meters are adequate for output trimming. Use the following steps to trim outputs.

2.3.3a Preliminary Steps

1. Make sure the recorder output mode switches on the corresponding channel card(s) are set for the correct output - current (I) or voltage (V).
2. Disconnect the load (e.g., indicator) from the end of the output signal wires.
3. Attach the digital multimeter to the signal wires in series or parallel.

2.3.3b Trimming the Zero Value

1. Be sure the meter highlights the desired **Channel** and **Output** (**A** or **B**).
2. Enter the % of scale. If your recorder is set up for 4 to 20-mA, enter 0. If your recorder is set up for 0 to 20-mA or 0 to 2-V output, enter 5.

Note: *The outputs can not be trimmed to output a value of 0.00 mA/0.000 V due to the limits imposed by electronic noise. The recorder output is typically 0.01 mA at zero output; therefore, you should use 5% for the test value for 0 to 20 mA and 0 to 2 V ranges.*

3. Observe the multimeter reading. Wait at least 5 seconds for the recorder output to settle. The multimeter should display one of the readings shown in *Table 6* below.

Table 6: Multimeter Readings per Output Range

Output Range	Multimeter Reading
0 to 20 mA (5%)	1.00 mA
4 to 20 mA (0%)	4.00 mA
0 to 2V (5%)	0.10 V

4. Press the TRIM key. The moisture.IQ displays the existing recorder trim value next to the 0% setting.The trim value will be labeled zero or span. If the span value displays, press the ZERO/SPAN menu key to display the zero trim value.
5. Press the TRIM UP or TRIM DN key to set the trim zero value to correct for the difference between the desired multimeter reading and the actual multimeter reading in Step 4.
6. Confirm that the digital multimeter display reads the correct 0% of full scale value (1 mA, 4 mA, or 0.1 V).

2.3.3c Trimming the Span Value

1. After trimming the zero value, enter 100 for % of scale.

2. Observe the multimeter reading. Wait at least 5 seconds for the recorder output to settle. The meter should display one of the readings shown in *Table 7* below.

Table 7: Multimeter Readings per Output Range

Output Range	Multimeter Reading
0 to 20 mA	20.00 mA
4 to 20 mA	20.00 mA
0 to 2V	2.0 V

3. Press the TRIM key. The moisture.IQ displays a recorder trim value next to the 100% setting. The trim value will be labeled Zero or Span. If the Zero value displays, press the ZERO/SPAN menu key to display the Span trim value.

4. Press the TRIM UP or TRIM DN menu key to set the trim span value to the difference between the desired and actual multimeter readings in Step 3. Confirm that the digital multimeter display reads the correct 100% of full scale value (20 mA or 2V).

2.3.4 Setting up the Alarms

The moisture.IQ has two optional alarms for each channel.

2.3.4a Configuring the Settings

To select the measurement mode, units and set point values for each alarm, press the **Alarms** button on the main screen. The screen appears similar to *Figure 40* below.

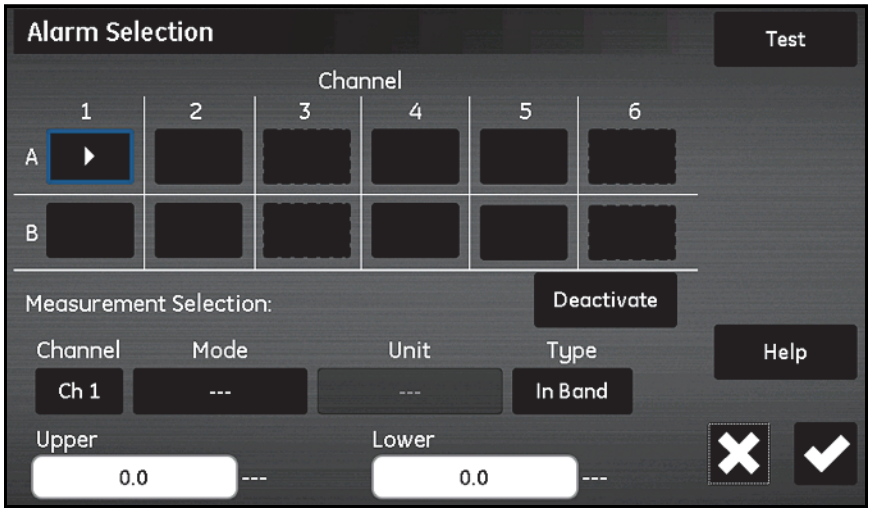

Figure 40: Alarm Selection Window

1. First, press on the desired **Channel** and **Alarm** (**A** or **B**).
2. Then go down to the Measurement Selection section and press the measurement **Mode, Unit** and **Type** you need. (For available modes and units, refer to *Table 5 on page 38*. The type options are **InBand, OutBand**, and **Setpoint**.)
3. Press the Upper box and enter the high setpoint value via the keypad. Repeat this procedure for the Lower (low setpoint) value.
4. To activate the alarm, press the **Activate** button.

2.3.4b Testing the Alarms

1. Be sure the meter highlights the desired **Channel** and **Alarm** (**A** or **B**).
2. Press the **Test** button. The word **"TRIPPED"** or **"RESET"** appears in the corresponding space.

2.3.5 Setting up and Running Logs

To set up and run logs, press the **Logger** button on the main screen. The screen appears similar to *Figure 41* below.

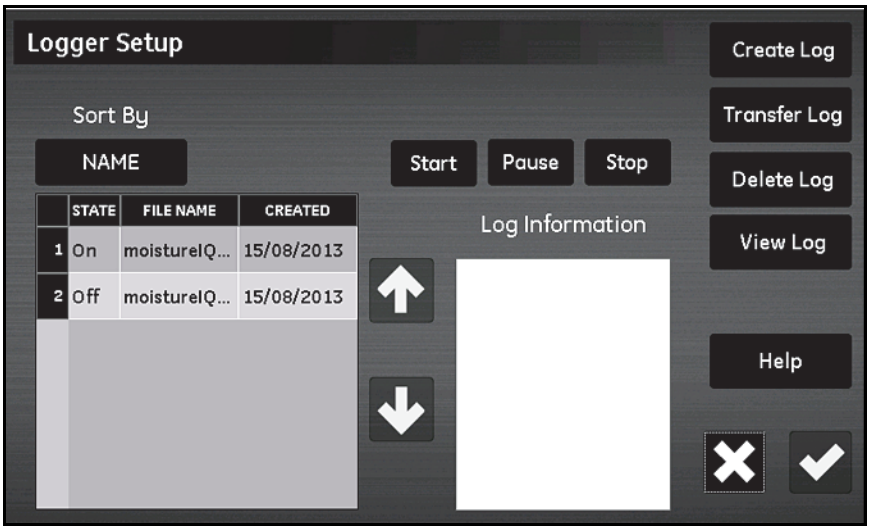

Figure 41: Logger Window

The pane on the left displays all current logs, which can be sorted by **Name, Date, Size** or **State**.

- To create a new log, press the **Create Log** button. The Log Creator window opens. Use the keyboard to enter the **Log Name, Start Time, End Time** and **Logging Interval.** You can also select the **Log Type: Normal, Cyclic or Error.** In the upper right, press **Log Data** to enter the specific **Channel(s), Mode(s)** and **Unit(s)** you need to log, and then return to the Log Creator window.
- To move a log, press **Transfer Log**. The menu then directs you to highlight a log and move it to a specified location.
- To delete a highlighted log, press **Delete Log**.
- To view data for a highlighted log, press **View Log.** The data appears in the **Log Information** pane at the right.

Use the three buttons in the center to **Start** a new or current log, **Pause** data logging, or **Stop** the log.

Chapter 3. Remote Programming over the Ethernet

WARNING! Connection to the Internet/WAN: The Ethernet capability provided in the moisture.IQ is designed for use on a limited-access Local Area Network (LAN) protected by a suitable firewall. It should not be operated if exposed to the Internet or other unmanaged Wide Area Network (WAN). Check with your network administrator to determine whether it is safe to connect moisture.IQ to your network infrastructure.

WARNING! Default Passwords: As shipped from the factory, there are two accounts enabled, with default passwords assigned. It is highly recommended that the default passwords be changed before placing the moisture.IQ into service.

Note: *This chapter assumes that you have read Chapters 1 and 2, and are familiar with the operation and installation of the moisture.IQ electronics and user interface.*

3.1 Connecting to an Ethernet LAN

The Ethernet port supports the 10Base-T and 100Base-TX twisted-pair Ethernet standards. An RJ-45 female modular connector is provided on the moisture.IQ rear panel for connection to the LAN.

3.2 Enabling the Ethernet Option

As shipped from the factory, Ethernet is disabled. Ethernet capability can be enabled or disabled via the moisture.IQ user menus. Before attempting to connect to or manage the Ethernet option, verify that the option is enabled:

From the moisture.IQ menu, select **Configuration > TCP/IP.**

Note: *Changes to the Configuration Settings below can only be made when LAN access is* disabled*. After changes are confirmed, enable LAN access to use the modified configuration.*

3.3 Dynamic / Static Address

The moisture.IQ can be configured with a static Internet Protocol (IP) address, or can use Dynamic Host Configuration Protocol (DHCP) to obtain an address from a DHCP server or router. No further address configuration is required. When using dynamic addressing, the fields for specifying the IP address, Subnet Mask, and Gateway Server cannot be edited. For troubleshooting purposes, the dynamically assigned addresses will be visible.

3.4 Static Addressing

Enter the static IP address in dotted decimal notation (e.g., “192.168.1.123”). It is also necessary to specify the subnet mask and gateway server address. Contact your network administrator to obtain the mask and gateway address to use.

3.5 Domain Name System (DNS)

The moisture.IQ may require access to a DNS server in order to resolve a host name (e.g., “GE.COM”) to an IP address. The address of the DNS server can be obtained automatically, or a static address can be specified. Contact your network administrator to determine the appropriate setting.

To activate the Ethernet connection, press **LAN Access**, choose **Enabled**, and confirm the changes. The Ethernet Media Access Control (MAC) address, which is unique for any Ethernet device, will display.

3.6 Capabilities of the Ethernet Connection

The moisture.IQ allows remote access and control through two methods:

- An embedded Web Server allows access to the moisture.IQ status and files using a standard web browser
- A Virtual Network Computing (VNC) server allows full remote control of the moisture.IQ using any of several VNC clients.

Both the Web Server and VNC Server are disabled by default.

Access to the web server requires a user name and password. The moisture.IQ provides two accounts for configuration and general administration. Up to three additional accounts can be created for use as needed. Each account has a set of permissions that can be configured to limit network access to moisture.IQ features.

The two pre-defined accounts are:

1. Admin
2. Operator

3.6.1 The Admin Account

The Admin account allows complete configuration of the Ethernet option. This account should be used only by experienced network administrators. Misuse of the root account could prevent connection to the moisture.IQ, or enable unauthorized access to the moisture.IQ, or possibly expose the network to unauthorized users and exploits.

The default login credentials for the Admin account are:

User name: Admin

Password: password

IMPORTANT: *It is IMPERATIVE that the Admin password be changed as soon as possible!*

Only the Admin can add, modify, or remove the other user accounts. To log in as the Admin, select **Configuration > User Management**. The Log In screen shown in *Figure 42* below is displayed.

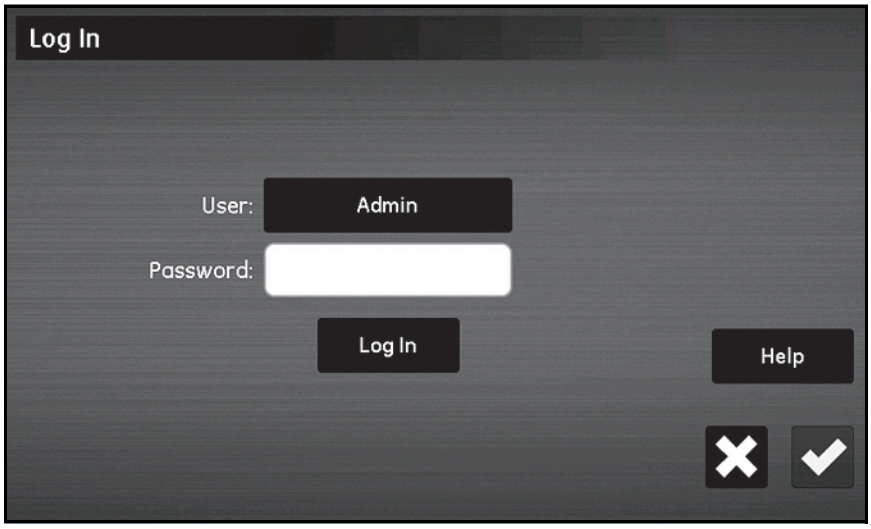

Figure 42: Log In Screen

3.6.1 The Admin Account (cont.)

Enter the password and press **Log In.** On a successful login, the Web User Management screen shown in *Figure 43* below is displayed.

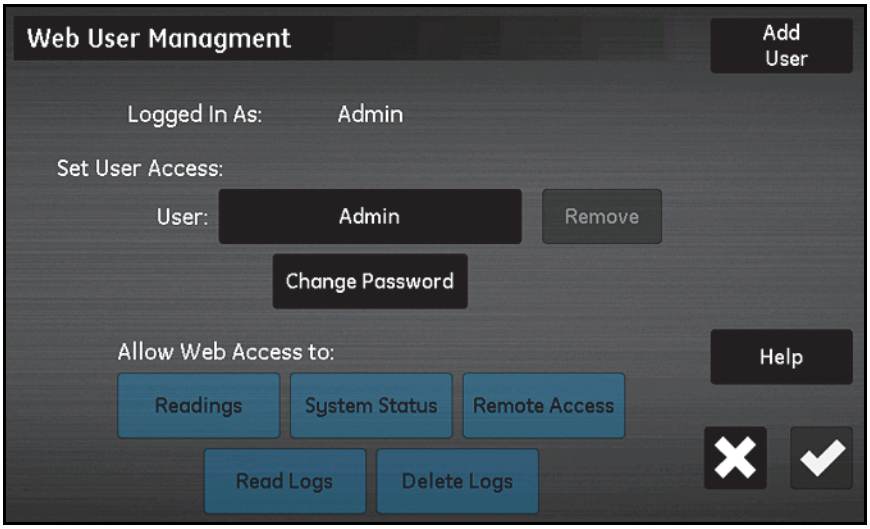

Figure 43: Web Server User Management Screen

Press **Change Password** to enter and confirm a new password for the Admin account:

WARNING! Record the new Admin password immediately and keep it in a safe and secure location. It is NOT POSSIBLE to obtain a lost/forgotten Admin password!

3.6.2 The Operator Account

The Operator account is provided to for day-to-day management of the moisture.IQ. By default, the Operator has all the same privileges as the Admin, but cannot create or modify other accounts.

The Operator account allows the user to:

- Enable/Disable DHCP
- Specify a static IP, subnet, and gateway IP address
- Modify some of the serial protocol settings
- View the serial port connection status
- View the TCP/IP connection status
- View the Ethernet option firmware version, serial port and network diagnostics.

The default login credentials for the Operator account are:

User name: operator
Password: password

The operator password should be changed at the earliest opportunity. The steps for changing the operator password are the same as changing the Admin password, above. Select the operator account from the user configuration screen, then enter and confirm the new password.

Record the new operator password immediately, and keep it in a safe and secure location.

Note: *If the operator password is lost, it can always be reset using the root account.*

[no content intended for this page]

Chapter 4. Maintenance

WARNING! Do not attempt maintenance of the moisture.IQ beyond the instructions in this section. If you do, you may damage the unit and void the warranty.
This chapter covers the following topics:

- Checking and Replenishing Electrolyte in the Delta F Oxygen Cell
- Adding or Removing a Channel Module
- Replacing and Recalibrating Moisture Probes
- Calibrating the Delta F Oxygen Cell
- Background Gas Correction Factors for the Delta F Oxygen Cell

4.1 Delta F Oxygen Cell Electrolyte

As a result of operating the moisture.IQ, particularly when monitoring dry gases, there may be a gradual loss of water from the electrolyte. The electrolyte level should be checked at regular intervals to ensure that the cell is always operating properly. This section describes how to check and replenish the electrolyte in the oxygen cell.

Note: *Some applications require that the electrolyte be changed periodically. Consult GE.*

4.1.1 Checking the Electrolyte Level

Using the min/max window on the oxygen cell, check the electrolyte level. The electrolyte should cover about 60% of the window. The electrolyte level should appear as shown in *Figure 44* below.

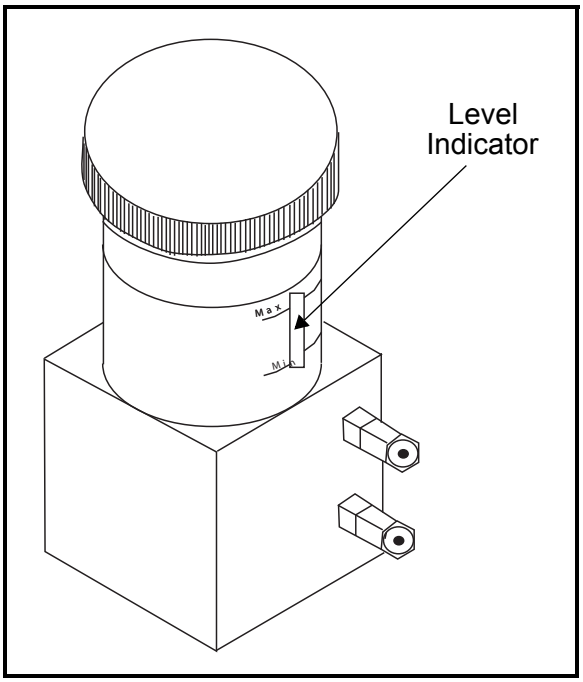

Figure 44: Electrolyte Level for the Delta F Oxygen Cell

4.1.2 Replenishing the Electrolyte

Once the oxygen cell receives the initial charge of electrolyte, you should monitor the level regularly. DO NOT let the fluid level drop below the “MIN” level mark on the window.

WARNING! The electrolyte contains a strong caustic ingredient and can be harmful if it comes in contact with the skin or the eyes. Follow proper procedures for handling the caustic (potassium hydroxide) solution. Consult your company safety personnel.

To raise the fluid level in the reservoir, add DISTILLED WATER slowly in small amounts. Check the level as you add the distilled water, making sure you do not overfill the reservoir. The electrolyte mixture should cover approximately 60% of the min/max window.

4.2 Adding/Removing a Channel Module

(To be added)

4.3 Replacing and Recalibrating Moisture Probes

For maximum accuracy you should send moisture probes back to the factory for recalibration every six months to one year, depending on the application. Under severe conditions you should send the probes back for recalibration more frequently; in milder applications you do not need to recalibrate probes as often. Contact a GE applications engineer for the recommended calibration frequency for your application.

When you receive new or recalibrated probes, be sure to install and connect them as described in *"Configuring and Setting up the Probes" on page 36*. After you have installed and connected the probes, enter the calibration data as described in *"Calibrating the Probes" on page 40.* Note that each probe has its own Calibration Data Sheet with the corresponding probe serial number printed on it.

You do not have to enter calibration data for the Moisture Image Series Probes (MISP) if you returned the MISP2 probe, or in the case of the original MIS Probe, both the sensor and the electronics module to the factory for recalibration. However, you should verify that the calibration data entered at the factory is correct (see *page 37*). If you sent only the sensor part of the original Moisture Image Series Probe to the factory (without the module), you must enter the calibration data manually.

4.4 Calibrating the Delta F Oxygen Cell

You should calibrate the Delta F Oxygen Cell when you initially receive it. After that, calibrate the oxygen cell once a month for the first three months, and then as needed. You should also calibrate the oxygen cell if you change the electrolyte.

Calibrating the oxygen cell involves three parts:

- displaying the oxygen content in PPMv and µA
- checking the oxygen cell calibration
- entering the new span value

4.4.1 Displaying Oxygen Content in PPMv and µA

1. Determine to which channel the Delta F Oxygen Cell is connected.
2. If you are not displaying oxygen data, configure the channel as described in *"Configuring the Probes" on page 37*.

Note: *A "Channel Not Installed" message appears if you select a channel where no channel module is installed. Select a different channel.*

4.4.2 Checking the Oxygen Cell Calibration

Note: *If your operational range of measurement is significantly below the span gas you are using, you may elect to input the PPM O_2 content of the span gas and the measured µA value as an alternative to the following procedure.*

To perform this part of calibration you must have a calibration gas with a known PPMv value and a calibration gas inlet valve.

Note: *GE recommends a span calibration gas be 80-100% of the span of the sensor's overall range in a background of nitrogen (e.g., 80-100 PPM O_2 in N_2 for a 0-100 PPM O_2 sensor).*

1. Run the calibration gas through the oxygen cell.
2. Read the PPM_v value. If it is correct your oxygen cell does not need calibration. If the reading is incorrect, you must calculate the new span reading (x). Solve the following equation for x:

$$x = IO_c + \frac{(OX_1 - OX_c)(IO_c - IO_0)}{(OX_c - OX_0)}$$

where
OX_c = Correct PPMv for calibration gas
OX_0 = Zero value in PPMv*
OX_1 = Span value in PPMv*
IO_c = Actual reading for calibration gas in µA
IO_0 = Zero value in µA*
x = New span reading in µA

*See the Calibration Data Sheet for the oxygen cell to obtain the necessary zero and span values.

Example:
If the calibration data for your cell is as follows:

OX_c = 75 PPMv = Correct PPM_v for cal gas
OX_0 = 0.050 PPM_v = Zero value in PPM_v
OX_1 = 100 PPMv = Span value in PPMv
IO_c = 290 µA = Actual reading for calibration gas
IO_0 = 0.4238 µA = Zero value

$$290 + \frac{(100 - 75)(290 - 0.4238)}{(75 - 0.05)} = x$$

The new span value (x) is 100 PPMv ≅ 387 µA. Enter the new value as described in Chapter 2.

4.5 Delta F Oxygen Cell Background Gas Correction Factors

The factory calibration procedure for Delta F oxygen cells uses nitrogen as the reference background gas. The moisture.IQ will measure oxygen incorrectly if the transport rate of oxygen through the cell diffusion barrier is different than the cell is calibrated for. Therefore, if you want to use a background gas other than nitrogen, you must recalibrate the meter for the desired gas.

The moisture.IQ can easily be recalibrated for a number of different background gases. To correct your system for the appropriate background gas, refer to *Table 8* below and enter the correct current multiplier into the "Oxygen Probe Calibration" section of the System Calibration Menu. A detailed explanation and description of this process follows.

Note: *In order for you to use the current multipliers in this chapter, your calibration data sheet should contain calibration data for nitrogen. If your calibration data sheet contains data for a background gas other than nitrogen, contact the factory for the nitrogen calibration sheet.*

4.5.1 Correcting for Different Background Gases

A single "Background Gas Correction Factor" based on the reference nitrogen measurement can be derived for each background gas because, in practice, the diffusion rate for a typical background gas is stable and predictable and because the cell's response is linear. The current multiplier that is entered into the "Oxygen Probe Calibration" section is the inverse of this "Background Gas Correction Factor."

For example, *Table 8* below represents the calibration values (two points) for a specific oxygen cell calibrated in nitrogen. This data is supplied with the cell and is stored in the user program.

Table 8: Oxygen Cell Calibration Data (ref. to nitrogen)

Zero Calibration Point	Zero PPM_V Value = .0500 PPM_V
	Zero µA Value = .9867 µA
Span Calibration Point	Span PPM_V Value =100.0 PPM_V
	Span µA Value = 300.1 µA

When the oxygen cell is used in a background gas other than nitrogen, users must enter the gas's current multiplier, listed in *Table 9 on page 67*. The moisture.IQ will apply the appropriate correction to the oxygen signal. The original calibration values for nitrogen are programmed into the "Oxygen Probe Calibration" section. However, the meter uses the current multiplier to determine the correct oxygen concentration.

4.5.2 Entering the Current Multiplier

To change the Current Multiplier:

Note: *The default setting for the Current Multiplier is 1.00.*

1. Select a Current Multiplier from *Table 9* below.

2. From the main screen, enter the Configuration Menu

3. Press on the desired channel.

4. (New content needed)

Table 9: Background Gas Current Multipliers

Background Gas	Current Multipliers			
	Up to 1000 PPM	5000-10,000 PPM	2.5% to 10%	25%
Argon (Ar)	0.97	0.96	0.95	0.98
Hydrogen (H_2)	1.64	1.96	2.38	1.35
Helium (He)	1.72	2.13	2.70	1.39
Methane (CH_4)	1.08	1.09	1.11	1.05
Ethane (C_2H_6)	0.87	0.84	0.81	0.91
Propylene (C_3H_6)	0.91	0.88	0.87	0.93
Propane (C_3H_8)	0.79	0.76	0.72	0.58
Butene (C_4H_8)	0.69	0.65	0.60	0.77
Butane (C_4H_{10})	0.68	0.63	0.58	0.76
Butadiene (C_6H_6)	0.71	0.66	0.62	0.79
Acetylene (C_2H_2)	0.95	0.94	0.93	0.97
Hexane (C_6H_{14})	0.57	0.52	0.89	0.67
Cyclohexane (C_6H_{12})	0.64	0.58	0.54	0.72
Vinyl Chloride (CH_2CHCl)	0.74	0.69	0.65	0.81
Vinylidene Chloride ($C_2H_2F_2$)	0.77	0.73	0.69	0.83
Neon (Ne)	1.18	1.23	1.28	1.11
Xenon (Xe)	0.70	0.65	0.61	0.78
Krypton (Kr)	0.83	0.79	0.76	0.88
Sulfur Hexaflouride (SF_6)	0.54	0.49	0.44	0.64
Freon 318 (C_4F_8)	0.39	0.34	0.30	0.49
Tetrafluoromethane (CF_4)	0.62	0.57	0.52	0.71
Carbon Monoxide (CO)	0.99	0.99	0.98	0.99

[no content intended for this page]

Chapter 5. Troubleshooting

The moisture.IQ is designed to be maintenance and trouble free; however, because of process conditions and other factors, minor problems may occur. Some of the most common problems and procedures are discussed in this section. If you cannot find the information you need in this section, please consult GE.

WARNING! Do not attempt to troubleshoot the moisture.IQ beyond the instructions in this section. If you do, you may damage the unit and void the warranty.

This chapter covers the following topics:

- Screen Messages
- Common Problems

5.1 Screen Messages

The moisture.IQ has several screen messages that may display during operation. Refer to *Table 10* below for a list of these messages and the possible causes.

Table 10: Screen Messages and the Possible Causes

Screen Message	Possible Cause	System Response	Action
CHANNEL NOT AVAILABLE	Module not installed	None	Select a different channel.
NO PROBE	Unit has not been configured for the probe activated. For example, you cannot display pressure on a channel where only an M Series probe is configured.	None	Make sure the correct probe is activated as described on page 37. Connect the required probe.
NOT AVAILABLE	The mode and/or units selected require more data or need a different probe. For example, you cannot read %RH with a moisture probe that does not have the temperature option.	None	Choose a different mode and/or units as described on page 37. Connect the required probe.
MIS NO LINK	Communication with a Moisture Image Series Probe has failed. The Moisture Image Series Probe is disconnected or damaged.	After the moisture.IQ performs 5 checks, it replaces data with the following default values: dew point = -110°C temperature = 70°C pressure = 0 psi.	Check the Moisture Image Series Probe connections. Replace the Moisture Image Series Probe.
Chan X: MIS BAD CRC (CRC - Cyclic Redundancy Check)	Communication link with Moisture Image Series Probe is established, but data is intermittent or distorted.	No Link Error	Check for cable breaks or high electro magnetic interference (EMI).
ADC Failure!	Primary A/D converter has failed.	Returns to zero.	Return unit for service.
f ( ): Invalid	User function invalid.	User function invalid.	Reenter or check user function.
f ( ): Div. by 0	User function attempted to divide by zero.	Error message.	Check logic of user function.
fp ( ): Math error	User function attempted illegal operation, such as the square root of –2.	Error message.	Check logic of user function.
f ( ): Missing #	User function has missing operand for an operator	Error message.	Check user function.
f ( ): Extra #	User function has extra operand or missing operator.	Error message.	Check user function.
f ( ): Missing Op	User function has missing operator or extra operand.	Error message.	Check user function.
f ( ): Extra Op	User function has extra operator or missing operand.	Error message.	Check user function.
f ( ): Too Complex	User function has too many terms, or the constant has >23 digits.	Error message.	Check user function.

Table 10: Screen Messages and the Possible Causes (cont.)

Screen Message	Possible Cause	System Response	Action
f ( ): Missing (	User function has unbalanced parentheses.	Error message.	Add missing parentheses.
f ( ): Missing)	User function has unbalanced parentheses.	Error message.	Add missing parentheses.
Under Range (See Range Error Description on page 33.)	The input signal is below the calibrated range of the probe.	Alarms and outputs respond as programmed. Refer to Chapter 4.	If measurement is not expected to be below scale, send probe to GE for evaluation.
Over Range (See *Range Error Description* on page page 33.)	The input signal is above the calibrated range of the probe.	Alarms and outputs respond as programmed. Refer to Chapter 4.	Change the measurement units so that the measurement is within range. For example, change ppb to ppm. Refer to page 37. If measurement is not expected to be above scale, send probe to GE for evaluation.
"Mode" Fault! – "Mode" is replaced by one of the available measurement modes.	The input signal from the probe exceeds the capacity of the analyzer electronics.	Alarms and outputs respond as programmed. Refer to Chapter 4.	If measurement is not expected to be above scale, check wiring for shorts, and if none are apparent, send probe to GE for evaluation.
Cal Error	During Auto-Cal, an internal reference is found to be outside its acceptable range. Signal Error has occurred.	Alarms and outputs respond as programmed. Refer to Chapter 4.	Make sure the analyzer is grounded properly. Make sure the ground bolt is installed on the channel card. Remove source of Signal Error and attempt another Auto-Cal. Contact GE.

5.2 Common Problems

If the moisture.IQ measurement readings seem strange or do not make sense, there may be a problem with the probe or the process system. *Table 11* below contains some of the most common measurement problems.

Table 11: Troubleshooting Guide for Common Problems

Symptom	Possible Cause	System Response	Action
Accuracy of moisture sensor is questioned.	Insufficient time for system to equilibrate	Probe reads too wet during dry down conditions, or too dry in wet up conditions.	Change the flow rate. A change in dew point indicates the sample system is not at equilibrium, or there is a leak. Allow sufficient time for the sample system to equilibrate and the moisture reading to become steady. Check for leaks.
	Dew point at sampling point is different than the dew point of the main stream.	Probe reads too wet or too dry.	Readings may be correct if the sampling point and main stream do not run under the same process conditions. Different process conditions cause readings to vary. If sampling point and main stream conditions are the same, check sample system pipes, and any pipe between the sample system and main stream for leaks. Also, check sample system for adsorbing water surfaces, such as rubber or plastic tubing, paper-type filters, or condensed water traps. Remove or replace contaminating parts with stainless steel parts.
	Sensor or sensor shield affected by process contaminants (refer to *Basic GE Sensing Hygrometry Principles*).	Probe reads too wet or too dry.	Clean the sensor and the sensor shield as described in document 916-064, *Basic GE Sensing Hygrometry Principles*. Then reinstall sensor.
	Sensor is contaminated with conductive particles (refer to *Basic GE Sensing Hygrometry Principles*).	Probe reads high dew point.	Clean the sensor and the sensor shield as described in document 916-064, *Basic GE Sensing Hygrometry Principles*. Then reinstall sensor.
	Sensor is corroded (refer to *Basic GE Sensing Hygrometry Principles*).	Probe reads too wet or too dry.	Return probe to factory for evaluation.
	Sensor temperature is greater than 70°C (158°F).	Probe reads too dry.	Return probe to factory for evaluation.
	Stream particles are causing abrasion.	Probe reads too wet or too dry	Return probe to factory for evaluation.
Screen always reads the wettest (highest)) programmed moisture calibration value while displaying dew/frost point.	Probe is saturated. Liquid water present on sensor surface and/or across electrical connections.		Clean the sensor and the sensor shield as described in document 916-064, *Basic GE Sensing Hygrometry Principles* Then reinstall sensor.
	Shorted circuit on sensor.		Run “dry gas” over sensor surface. If high reading persists, then probe is probably shorted and should be returned to the factory for evaluation
	Sensor is contaminated with conductive particles (refer to *Basic GE Sensing Hygrometry Principles*.		Clean the sensor and the sensor shield as described in document 916-064, *Basic GE Sensing Hygrometry Principles*. Then reinstall sensor.
	Improper cable connection.		Check the cable connections to both the probe and the moisture.IQ.

Table 11: Troubleshooting Guide for Common Problems (cont.)

Symptom	Possible Cause	System Response	Action
Screen always reads the driest (lowest) programmed moisture calibration value while displaying dew/frost point.	Open circuit on sensor.		Return probe to factory for evaluation.
	Non-conductive material is trapped under contact arm of sensor.		Clean the sensor and the sensor shield as described in document 916-064, *Basic GE Sensing Hygrometry Principles*. Then reinstall the sensor. If the low reading persists, return the probe to the factory for evaluation.
	Improper cable connection.		Check the cable connections to both the probe and the moisture.IQ.
Slow response.	Slow outgassing of system.		Replace the system components with stainless steel or electro-polished stainless steel.
	Sensor is contaminated with non-conductive particles (refer to *Basic GE Sensing Hygrometry Principles*).		Clean the sensor and the sensor shield as described in document 916-064, *Basic GE Sensing Hygrometry Principles*. Then reinstall the sensor.
Exception screen	Unrecoverable software error.		Contact GE.

[no content intended for this page]

Chapter 6. Specifications

6.1 Overall Specifications

General

Microprocessor-based, one- to six-channel, aluminum oxide, absolute humidity/oxygen analyzer system.

Power

Universal power supply adjusts automatically from 100 to 240 VAC, 50/60 Hz, 60 Watts maximum power.

Note: *Power cord is the main disconnect device.*

Fuses

T4A, 250 VAC, 5x20 mm

Configuration

Rack, Bench, Panel, Type-4 Weatherproof, and Type-7 Explosion-proof.

Dimensions

Rack Mount: 482.60 x 132 x 457-495 mm (19.00 x 5.197 x 17.992- 19.488 in)
Bench Mount: 440 x 132.45 x 353.80 mm (17.323 x 5.215 x 13.929 in)
Panel Mount: 541.50 x 200.50 x 326.40 mm (21.319 x 7.894 x 12.850 in)

Parameters

Up to six channels may be programmed to measure any of the following parameters with appropriate probes: moisture, temperature, pressure, and oxygen.

European Compliance

This unit complies with EMC Directive 2004/108/EC and Low Voltage Directive 2006/95/EC (Installation Category II, Pollution Degree 2).

Note: *GE does <u>not</u> provide power supply cords with weatherproof or explosion-proof hygrometers.*

6.2 Moisture Measurement

Sensor Type

Thin-film aluminum oxide moisture sensor probe.

Moisture Probe Compatibility

Compatible with all GE aluminum oxide moisture probes.

Traceability

All moisture probe calibrations are traceable to national standards.

Dew/Frost Point Temperature

Overall Calibration Range Capability: –110° to 60°C (–166° to 140°F)

Available Calibration Range Options:
Standard: –80° to 20°C (–112° to 68°F) with data to –110°C (–166°F)
Ultra-Low: –110° to -50°C (–166° to -58°F)
Extended High: –80° to 60°C (–112° to 140°F) with data to -110°C (-166°F)

Accuracy:
±2°C from -65 to 60°C (-85 to 140°F)
±3°C from -110 to -66°C (-166 to -87°F)

Repeatability:
±0.5°C from -65 to 60°C (-85 to 140°F)
±1.0°C from -110 to 66°C (-166 to -87°F)

Note: *All dew/frost point outputs are available in °C or °F.*

Other Moisture Parameters

(Calculated using moisture and temperature or pressure inputs) Relative Humidity (RH)
Parts per Million by Volume (PPM_v) in a gas
Parts per Billion by Volume (PPB_v) in a gas
Parts per Million by Weight (PPM_w) in a liquid
Pounds per Million Standard Cubic Feet of Natural Gas or Ideal Gas (#/MMSCF)
Vapor Pressure (mmHg)
Vapor Pressure (Pascals)

Contact GE for the availability of other special measuring modes.

6.3 Pressure Measurement

Type

Optional transducer built into Moisture Image Series moisture probes.

Range

30 to 300 PSIG
50 to 500 PSIG
100 to 1000 PSIG
300 to 3000 PSIG
500 to 5000 PSIG

Accuracy

±1% of span

6.4 Temperature Measurement

Type

Optional thermistor built into M or Moisture Image Series moisture probes.

Range

–30° to 70°C (–22° to 158°F)

Accuracy

±0.5°C (0.9°F)

Note: *All temperature outputs available in °C or °F.*

6.5 Oxygen Measurement

Type

Delta F, non-depleting electrochemical cell. Also compatible with other GE oxygen analyzers.

Range

0-500 PPB_v
0-10,000 PPM_v in four ranges
0-25% in three ranges

Accuracy

±1% full scale (ranges >0-2.5 PPM_v)
±5% full scale (ranges <0-2.5 PPM_v)

6.6 Electronic Specifications

Display

Resistive WVGA, 800 (H), x 480 (V),pixels with touch screen.

Display Functions

Display up to 12 channel/parameter combinations simultaneously using text and/or graphics.

Operating Temperature

-20°C to 60°C (-4°F to 140°F)

Storage Temperature

-40°C to 70°C (-40°F to 158°F)

Auto-Calibration

Occurs on power up and at user-selectable time intervals.

Warm-up Time

Meets specified accuracy within 5 minutes of turn-on.

Data Logging

Up to six simultaneous logs per storage device, with up to 12 parameters each. Stored in 4 GB Micro SDHC.

6.7 Output Specifications

Analog

Six per 3-CH module, two per 1-CH module
Internally isolated
12 bit (0.025% Resolution)

Standard Switch-Selectable Outputs

- 0 to 2 V, 10K ohm minimum load resistance
- 0 to 20 mA, 400 ohm maximum series resistance
- 4 to 20 mA, 400 ohm maximum series resistance

Each output can correspond to any one parameter on that channel. Zero and span are user-programmable within the range of the instrument and the corresponding sensor.

Digital Outputs

Choice of RS232/RS485 serial communications port, USB, or Ethernet. Baud rates include:

- 300
- 1200
- 2400
- 4800
- 9600
- 19200
- 38400
- 57600
- 115200

Alarm Relays

Six per 3-CH module, two per 1-CH module. 1 Form C relay SPDT, rated for 2 amps at 28 VDC/28 VAC. Available for high and low limits. The relay contacts can be set to trip at any numerical level within the range of the instrument.

Output Updating

The microprocessor samples, processes data, and calculates values for each channel sequentially. The minimum update time is 1 second depending on configuration and mode. Channels are updated sequentially.

6.8 Input Specifications

Capability

Note: *Each module can be configured as one or three channels.*

1 to 6 channels moisture
1 to 6 channels temperature
1 to 6 channels pressure
1 to 6 channels oxygen
2 auxiliary inputs per installed channel

May be used for 0 to 2 mA, 4 to 20-mA, and voltage-based transmitter in the -1 to +4-V range including devices such as Oxygen Analyzers, Thermal Conductivity Analyzers, Flowmeters, Pressure Transmitters, Temperature Transmitters, etc.

Resolution

16 bits

Moisture Sensor Probes

GE types: M Series, Moisture Image Series, and MISP2.

Temperature Sensor

Thermistor (optionally supplied as part of the moisture probe assembly).

Pressure Transmitter

A pressure transducer is optionally available for Moisture Image Series probes. GE P40, P40X, or equivalent 4-20 mA, current-transmitting, pressure transducer; scale factors are entered as part of the user-program sequence.

Intrinsic Safety

Built-in intrinsic safety provided for all inputs per drawing #752-364 excluding auxiliary inputs.

6.9 Probe Specifications

6.9.1 Moisture Image Series Probe or MISP2

Type

Aluminum oxide moisture sensor probe and electronics module.

Calibration

Each sensor is individually computer calibrated against known moisture concentrations, traceable to national standards.

Process Temperature

–110°C to 70°C (–166°F to 158°F) dew/frost point temperature

Storage Temperature

70°C (158°F) maximum

Operating Pressure

5 microns of Hg to 5000 PSIG

Flow Range

Gases: Static to 10,000 cm/sec linear velocity at 1 atm

Liquids: Static to 10 cm/sec linear velocity at 1 g/cc

Response Time: <5 seconds for 63% step change in moisture content in either wet up or dry down cycle.

Moisture Image Series Probe/Analyzer Separation

915 meters (3000 feet) with provided cable.

Moisture Image Series Probe/Analyzer Cable

Unshielded, twisted pair, maximum loop resistance of 100 ohms

Built-in Temperature Sensor (optional)

Type: Thermistor network

Operating Range: –30°C to 70°C (–22°F to 158°F)

Accuracy: ±0.5°C overall

6.9.1 Moisture Image Series Probe or MISP2 (cont.)

Built-in Pressure Sensor (optional)

Type: Solid state/piezoresistive

Available Ranges:
30 to 300 PSIG
50 to 500 PSIG
100 to 1000 PSIG
300 to 3000 PSIG
500 to 5000 PSIG

Accuracy: ±1% of span

6.9.2 M Series Probe

Type

Aluminum oxide moisture sensor probe (patented).

Impedance Range

50 kΩ to 2 MΩ at 77 Hz (depending on vapor pressure of water).

Calibration

Each sensor is individually computer-calibrated against known moisture concentrations, traceable to national standards.

Operating Temperature

–110° to 70°C (–166° to 158°F)

Storage Temperature

Maximum of 70°C (158°F)

Operating Pressure (depends on mount)

M1: 5 microns Hg to 75 PSIG
M2: 5 microns Hg to 5000 PSIG

Flow Range

Gases: From static to 10,000 cm/sec linear velocity at 1 atm

Liquids: From static to 10 cm/sec linear velocity at density of 1 gm/cc

Built-in Temperature Sensor

Type: Non-linear thermistor

Range: –30 ° to 70°C (–22° to 158°F)

Accuracy: ±0.5°C (± 0.33F) overall

Response Time: Maximum 1 second in well stirred oil.
10 seconds in still air for a 63% step change in increasing or decreasing temperature.

6.9.3 Delta F Oxygen Cell

Type

Non-depleting electrolytic oxygen sensing cell.

Available Cells

PPB_v O_2 Range:
L: 0 to 500 ppb_v/5 ppm_v/50 ppm_v
Ranges for each cell are software selectable in GE analyzers.

PPM_v O_2 Ranges:
A:0 to 1/10/100 ppm_v
B:0 to 10/100/1000 ppm_v
C:0 to 100/1000/10,000 ppm_v
D:0 to 50/500/5000 ppm_v
Ranges for each cell are software selectable in GE analyzers.

Percent O_2 Ranges:
A: 0 to 5%
B: 0 to 10%
C: 0 to 25%

Accuracy

±1% full scale (ranges > 0 to 2.5 ppm_v)
±5% full scale (ranges < 0 to 2.5 ppm_v)

Sensitivity

< 5 ppb (0 to 500 ppb_v range)

Response Time

Sensor responds instantaneously to O_2 change.
Equilibrium time is application specific.

Ambient Temperature

0° to 49°C (32° to 120°F)

Background Gas Compatibility

Standard Cell: Ultra-pure inert gases

STAB-EL™ Cell: All gas compositions including those containing “acid” gases such as CO_2, H_2S, Cl_2, NO_x, SO_2, etc.

6.9.3 Delta F Oxygen Cell (cont.)

Sample Requirements

Temperature: –18° to 66°C

Inlet Pressure:
<-0.5 psig (use compressor)
-0.5 psig to 0.2 psig (use pump)
0.2 to 1.0 psig (standard range)
1.0 to 60 psig (use valve or regulator)
>60 psig (use pressure regulator)

Flow Rate: 0.5 to 1 LPM / 1 to 2 SCFH

Moisture: No limits (avoid condensation)

Oil/Solvent Mist:
<0.5 mg/feet^3 (standard range)
>0.5 mg/feet^3 (use filter)

Solid Particles:
<2.0 mg/feet^3(standard range)
>2.0 mg/feet^3 (use filter)

Note: *STAB-EL™ cell is a registered trademark of Servomex.*

Appendix A. Menu Maps

A.1 Main Menu Map

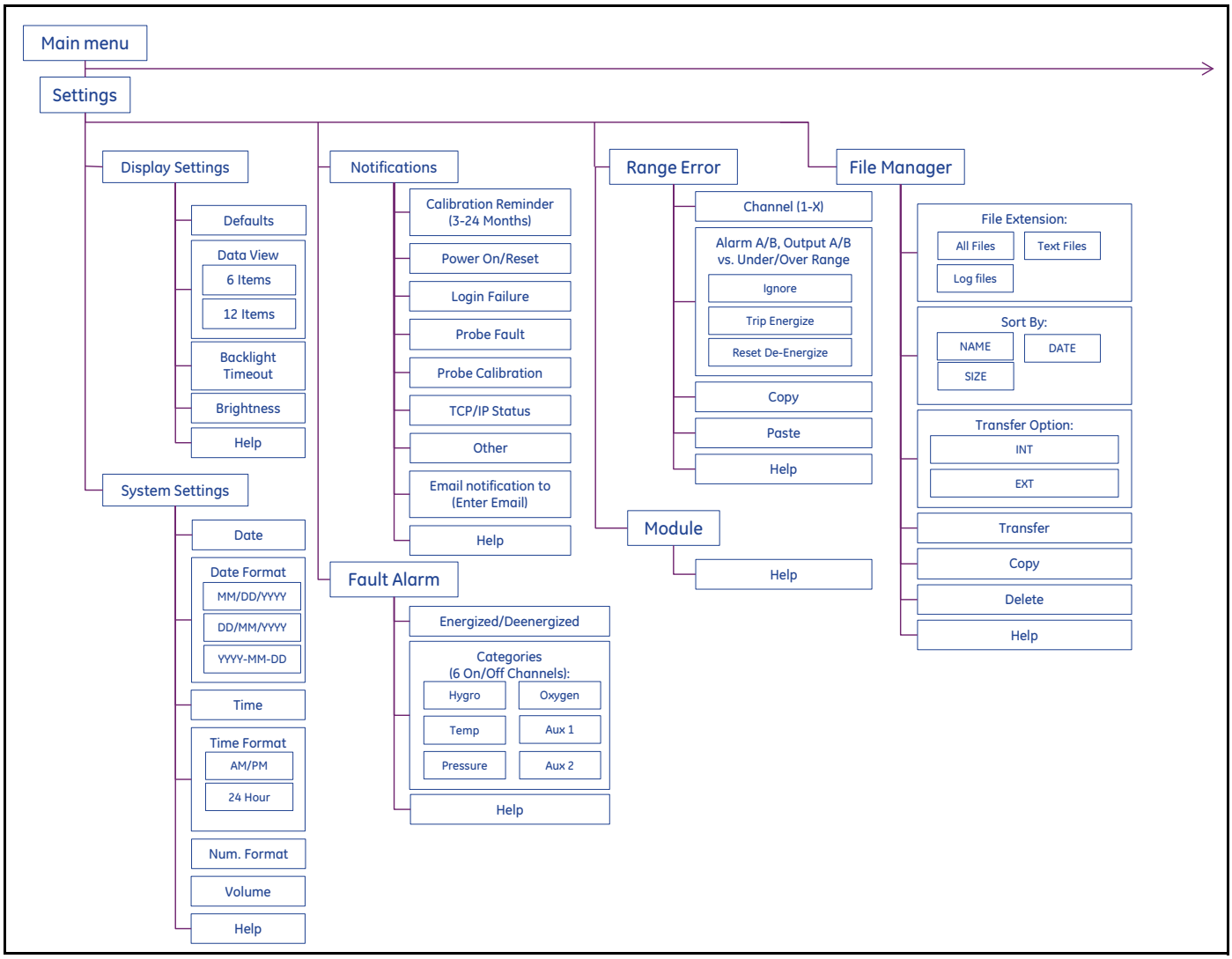

Figure 45: Main Menu Map

A.2 Output and Alarm Menu Map

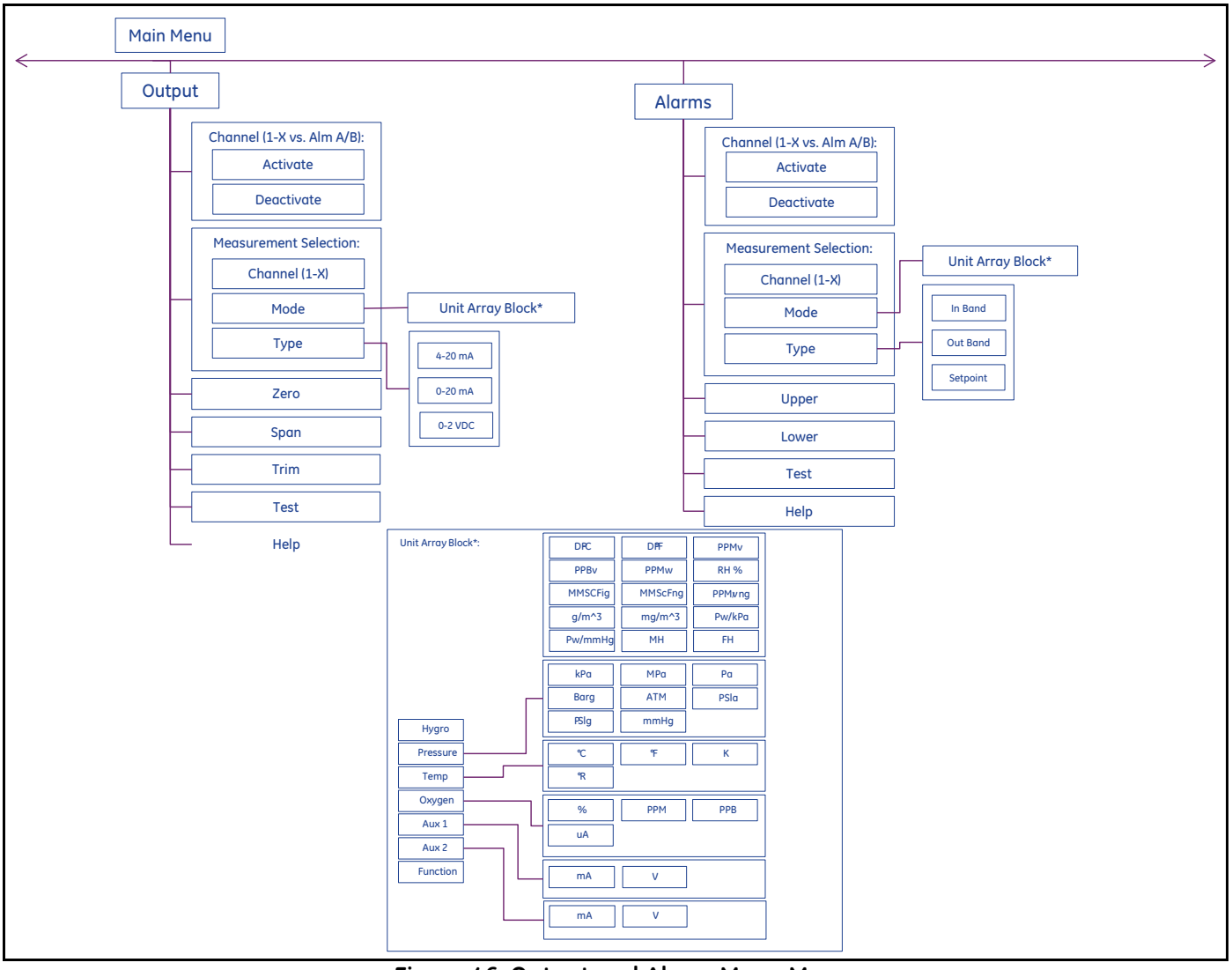

Figure 46: Output and Alarm Menu Map

A.3 Configuration Menu Map (Part 1)

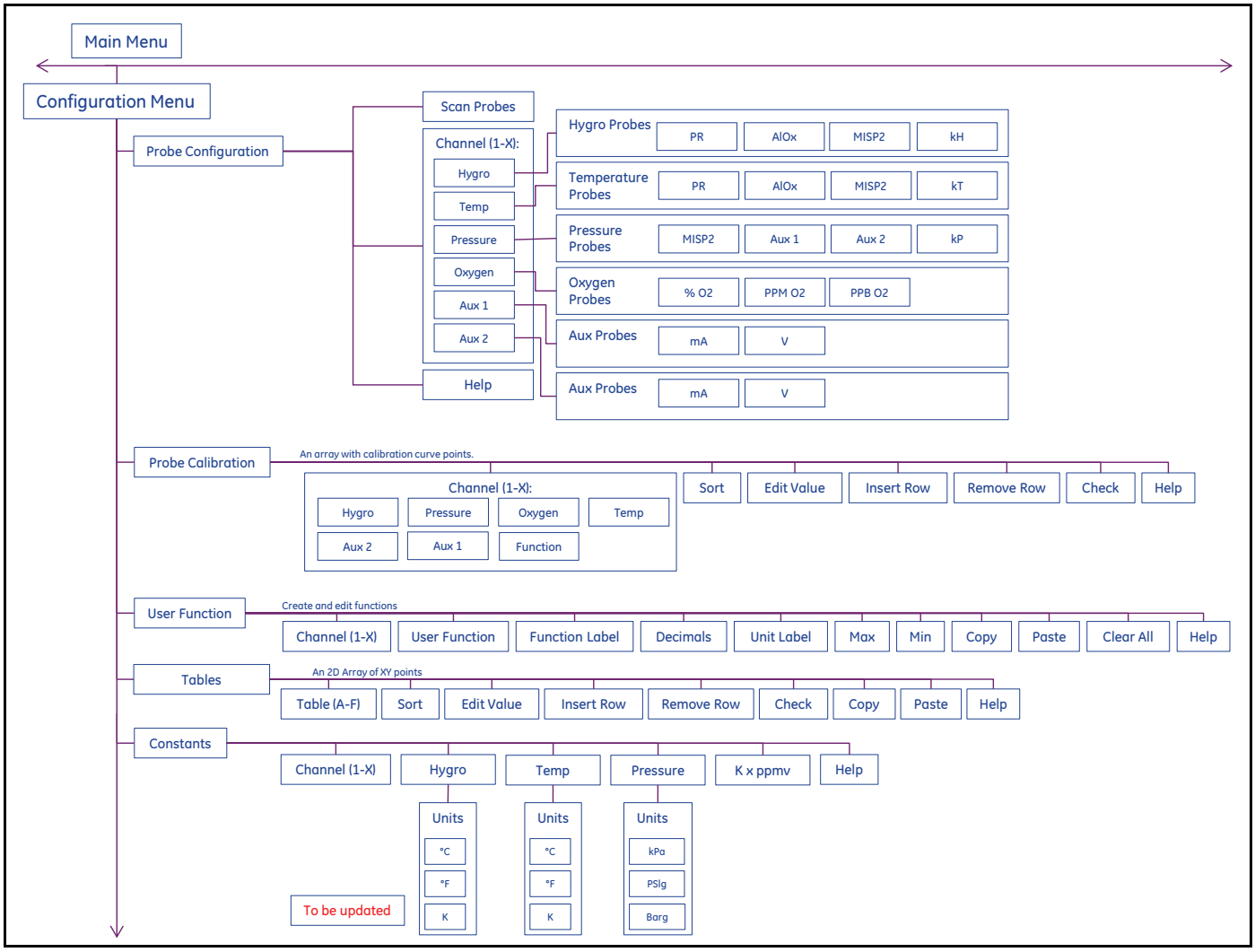

Figure 47: Configuration Menu Map, Part 1

A.4 Configuration Menu Map (Part 2)

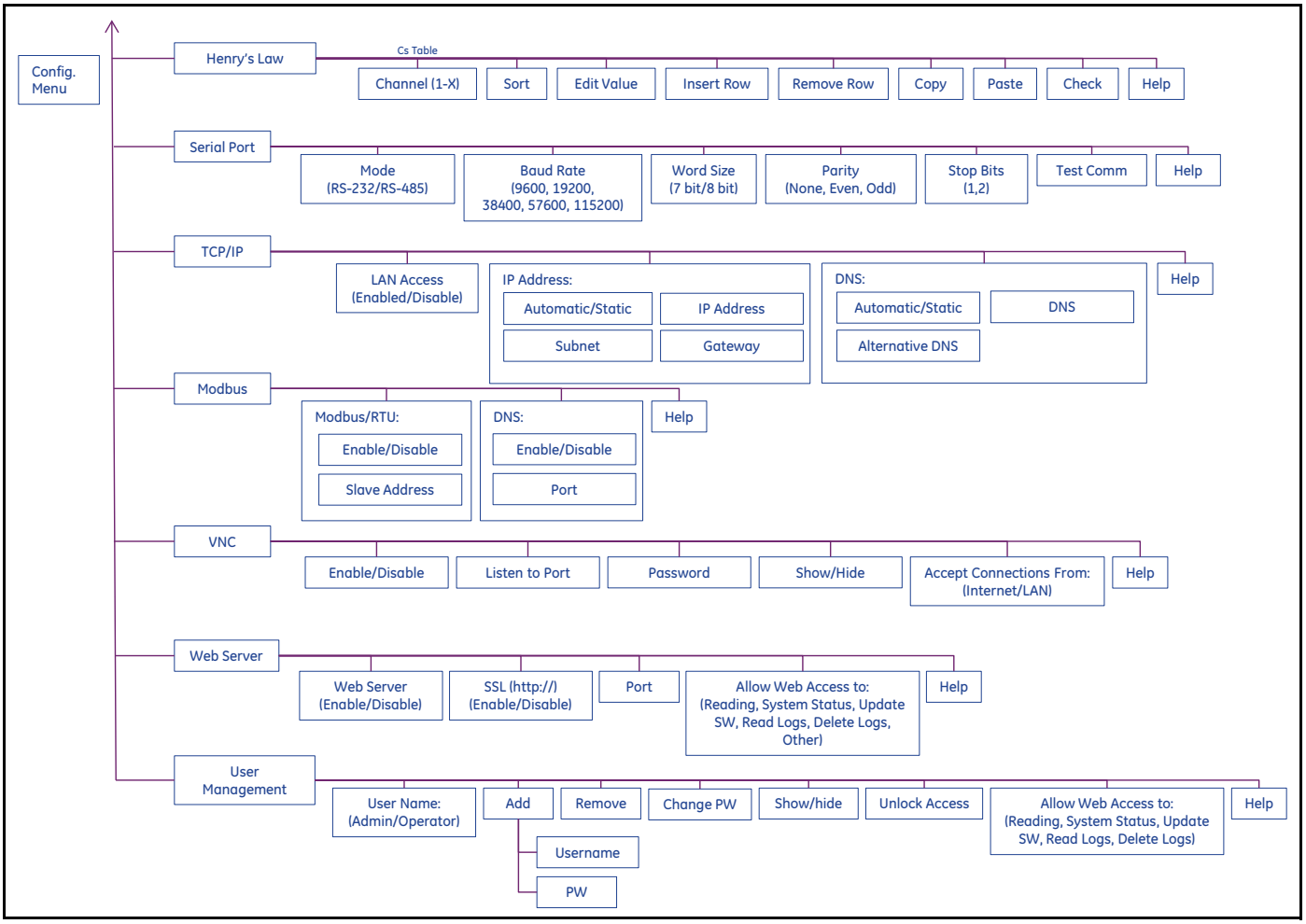

Figure 48: Configuration Menu Map, Part 2

A.5 Logger and Data Element Editor Menu Map

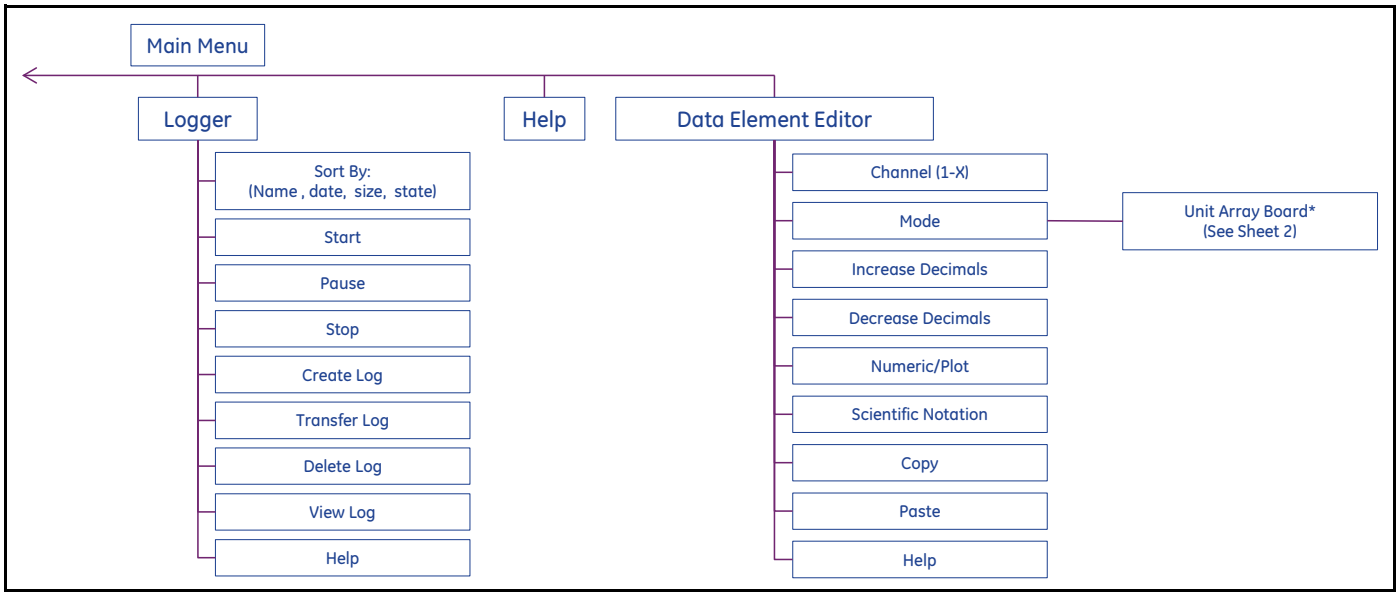

Figure 49: Logger and Data Element Editor Menu Map

[no content intended for this page]

Appendix B. Certification and Safety Statements

B.1 Installation

Field wiring shall be rated for a minimum of 68° C.

Installation should comply with 752-364 control drawing (see *Figure 50* below and *Figure 51 on page 94*).

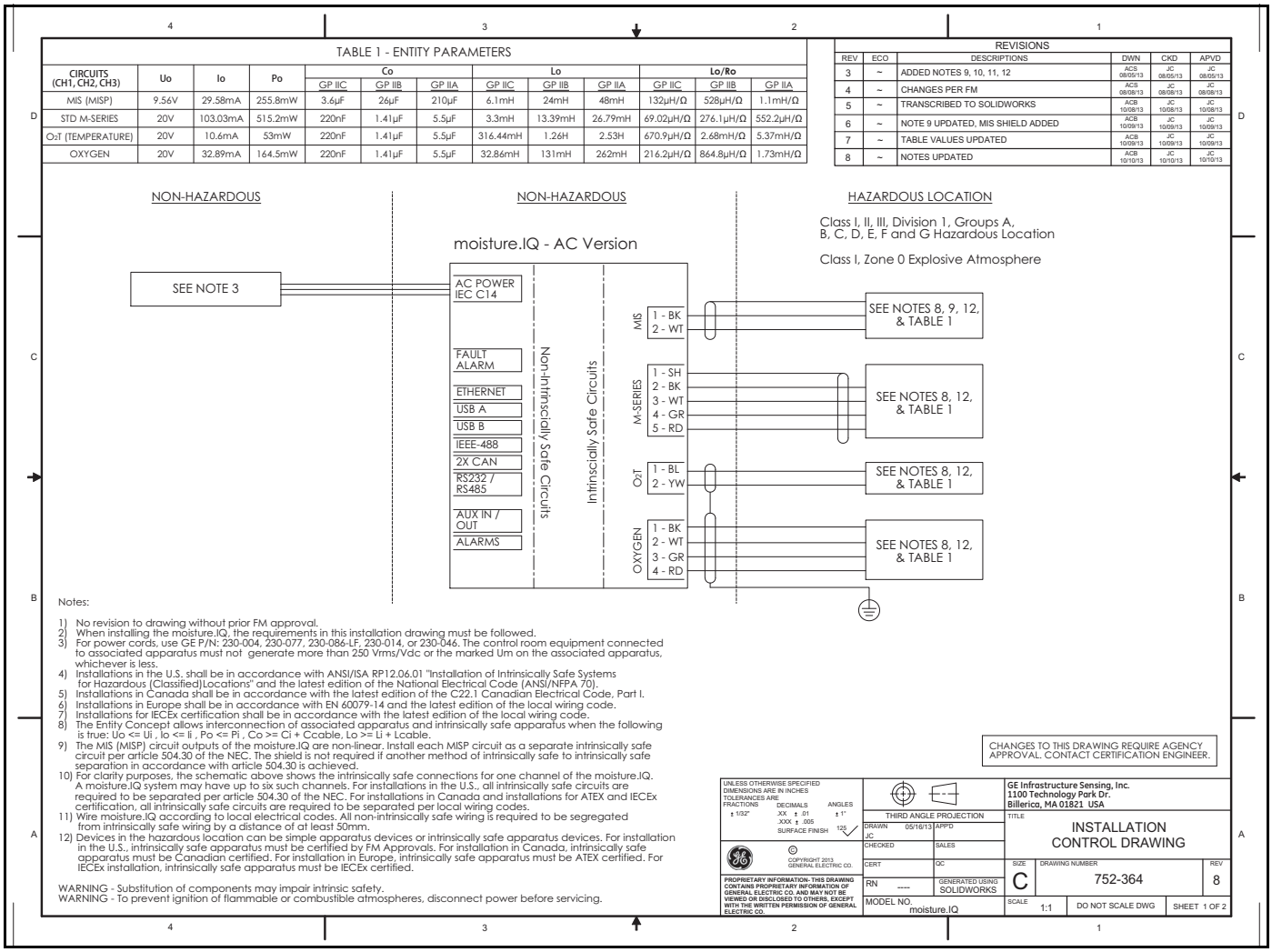
TABLE 1 - ENTITY PARAMETERS
CIRCUITS (CH1, CH2, CH3)
Uo
Io
Po
Co
Lo
Lo/Ro
GP IIC
GP IIB
GP IIA
MIS (MISP) 9.56V 29.58mA 255.8mW 3.6µF 26µF 210µF 6.1mH 24mH 48mH 132µH/Ω 528µH/Ω 1.1mH/Ω
STD M-SERIES 20V 103.03mA 515.2mW 220nF 1.41µF 5.5µF 3.3mH 13.39mH 26.79mH 69.02µH/Ω 276.1µH/Ω 552.2µH/Ω
O2T (TEMPERATURE) 20V 10.6mA 53mW 220nF 1.41µF 5.5µF 316.44mH 1.26H 2.53H 670.9µH/Ω 2.68mH/Ω 5.37mH/Ω
OXYGEN 20V 32.89mA 164.5mW 220nF 1.41µF 5.5µF 32.86mH 131mH 262mH 216.2µH/Ω 864.8µH/Ω 1.73mH/Ω
REVISIONS
REV ECO DESCRIPTIONS DWN CKD APVD
3 ~ ADDED NOTES 9, 10, 11, 12 ACB 08/05/13 JC 08/05/13 JC 08/05/13
4 ~ CHANGES PER FM ACB 08/08/13 JC 08/08/13 JC 08/08/13
5 ~ TRANSCRIBED TO SOLIDWORKS ACB 10/08/13 JC 10/08/13 JC 10/08/13
6 ~ NOTE 9 UPDATED, MIS SHIELD ADDED ACB 10/09/13 JC 10/09/13 JC 10/09/13
7 ~ TABLE VALUES UPDATED ACB 10/09/13 JC 10/09/13 JC 10/09/13
8 ~ NOTES UPDATED ACB 10/10/13 JC 10/10/13 JC 10/10/13
NON-HAZARDOUS
NON-HAZARDOUS
HAZARDOUS LOCATION
Class I, II, III, Division 1, Groups A, B, C, D, E, F and G Hazardous Location
Class I, Zone 0 Explosive Atmosphere
moisture.IQ - AC Version
SEE NOTE 3
AC POWER IEC C14
FAULT ALARM
ETHERNET
USB A
USB B
IEEE-488
2X CAN
RS232 / RS485
AUX IN / OUT
ALARMS
Non-Intrinsically Safe Circuits
Intrinsically Safe Circuits
MIS
1 - BK
2 - WT
M-SERIES
1 - SH
2 - BK
3 - WT
4 - GR
5 - RD
O2T
1 - BL
2 - YW
OXYGEN
1 - BK
2 - WT
3 - GR
4 - RD
SEE NOTES 8, 9, 12, & TABLE 1
SEE NOTES 8, 12, & TABLE 1
SEE NOTES 8, 12, & TABLE 1
SEE NOTES 8, 12, & TABLE 1
Notes:
1) No revision to drawing without prior FM approval.
2) When installing the moisture.IQ, the requirements in this installation drawing must be followed.
3) For power cords, use GE P/N: 230-004, 230-077, 230-086-LF, 230-014, or 230-046. The control room equipment connected to associated apparatus must not generate more than 250 Vrms/Vdc or the marked Um on the associated apparatus, whichever is less.
4) Installations in the U.S. shall be in accordance with ANSI/ISA RP12.06.01 "Installation of Intrinsically Safe Systems for Hazardous (Classified)Locations" and the latest edition of the National Electrical Code (ANSI/NFPA 70).
5) Installations in Canada shall be in accordance with the latest edition of the C22.1 Canadian Electrical Code, Part I.
6) Installations in Europe shall be in accordance with EN 60079-14 and the latest edition of the local wiring code.
7) Installations for IECEx certification shall be in accordance with the latest edition of the local wiring code.
8) The Entity Concept allows interconnection of associated apparatus and intrinsically safe apparatus when the following is true: Uo <= Ui , Io <= Ii , Po <= Pi , Co >= Ci + Ccable, Lo >= Li + Lcable.
9) The MIS (MISP) circuit outputs of the moisture.IQ are non-linear. Install each MISP circuit as a separate intrinsically safe circuit per article 504.30 of the NEC. The shield is not required if another method of intrinsically safe to intrinsically safe separation in accordance with article 504.30 is achieved.
10) For clarity purposes, the schematic above shows the intrinsically safe connections for one channel of the moisture.IQ. A moisture.IQ system may have up to six such channels. For installations in the U.S., all intrinsically safe circuits are required to be separated per article 504.30 of the NEC. For installations in Canada and installations for ATEX and IECEx certification, all intrinsically safe circuits are required to be separated per local wiring codes.
11) Wire moisture.IQ according to local electrical codes. All non-intrinsically safe wiring is required to be segregated from intrinsically safe wiring by a distance of at least 50mm.
12) Devices in the hazardous location can be simple apparatus devices or intrinsically safe apparatus devices. For installation in the U.S., intrinsically safe apparatus must be certified by FM Approvals. For installation in Canada, intrinsically safe apparatus must be Canadian certified. For installation in Europe, intrinsically safe apparatus must be ATEX certified. For IECEx installation, intrinsically safe apparatus must be IECEx certified.
WARNING - Substitution of components may impair intrinsic safety.
WARNING - To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.
CHANGES TO THIS DRAWING REQUIRE AGENCY APPROVAL. CONTACT CERTIFICATION ENGINEER.
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS ± 1/32" DECIMALS .XX ± .01 .XXX ± .005 ANGLES ± 1° SURFACE FINISH 125
COPYRIGHT 2013 GENERAL ELECTRIC CO.
PROPRIETARY INFORMATION- THIS DRAWING CONTAINS PROPRIETARY INFORMATION OF GENERAL ELECTRIC CO. AND MAY NOT BE VIEWED OR DISCLOSED TO OTHERS, EXCEPT WITH THE WRITTEN PERMISSION OF GENERAL ELECTRIC CO.
THIRD ANGLE PROJECTION
DRAWN JC 05/16/13 APP'D
CHECKED
CERT
QC
SALES
RN ----
GENERATED USING SOLIDWORKS
MODEL NO. moisture.IQ
GE Infrastructure Sensing, Inc.
1100 Technology Park Dr.
Billerica, MA 01821 USA
TITLE
INSTALLATION CONTROL DRAWING
SIZE C
DRAWING NUMBER 752-364
REV 8
SCALE 1:1
DO NOT SCALE DWG
SHEET 1 OF 2

Figure 50: Dwg. 752-364, sh. 1

B.1 Installation (cont.)

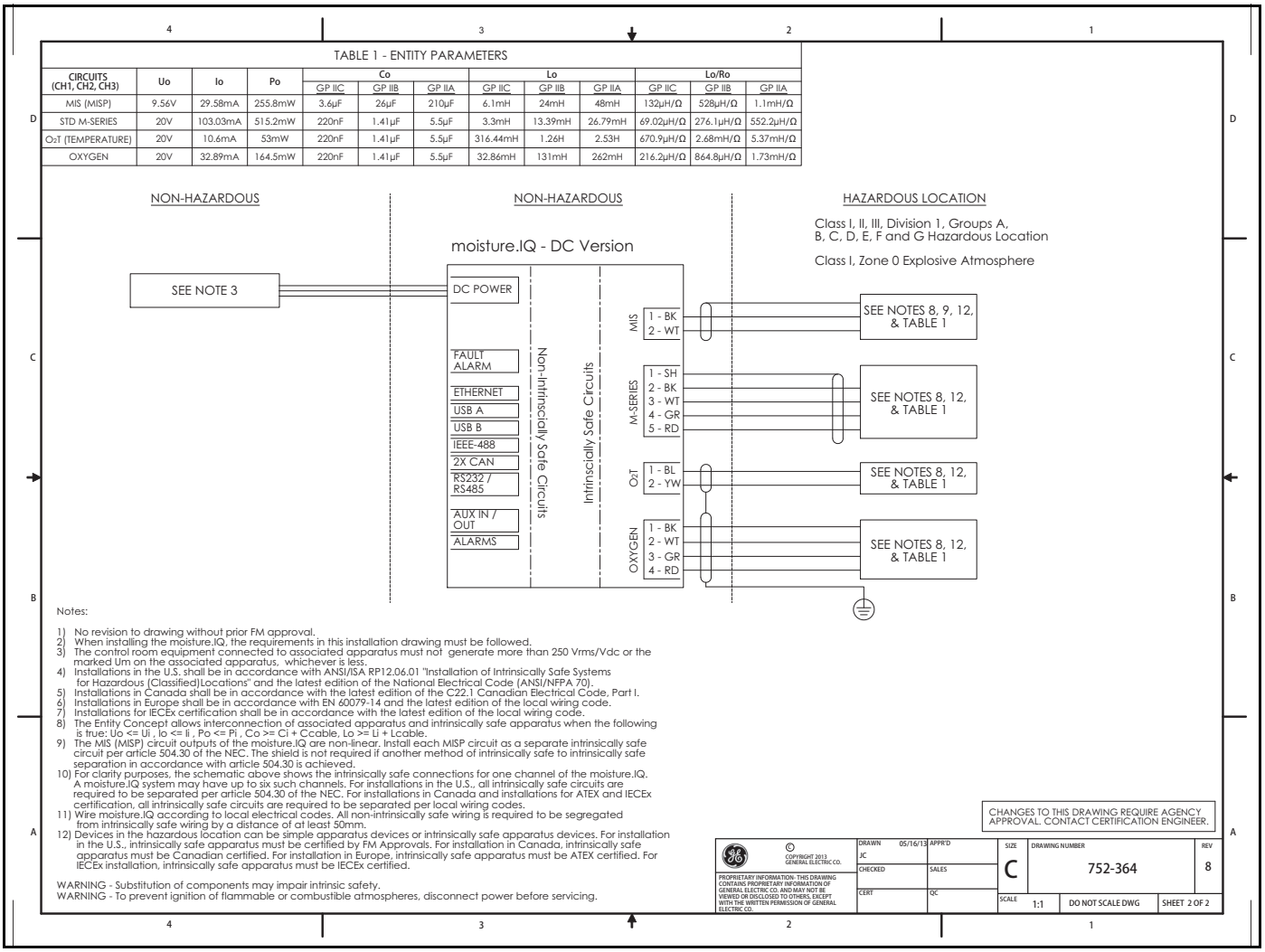
TABLE 1 - ENTITY PARAMETERS
CIRCUITS (CH1, CH2, CH3) | Uo | Io | Po | Co | | | Lo | | | Lo/Ro | | |
GP IIC | GP IIB | GP IIA | GP IIC | GP IIB | GP IIA | GP IIC | GP IIB | GP IIA
MIS (MISP) | 9.56V | 29.58mA | 255.8mW | 3.6µF | 26µF | 210µF | 6.1mH | 24mH | 48mH | 132µH/Ω | 528µH/Ω | 1.1mH/Ω
STD M-SERIES | 20V | 103.03mA | 515.2mW | 220nF | 1.41µF | 5.5µF | 3.3mH | 13.39mH | 26.79mH | 69.02µH/Ω | 276.1µH/Ω | 552.2µH/Ω
O2T (TEMPERATURE) | 20V | 10.6mA | 53mW | 220nF | 1.41µF | 5.5µF | 316.44mH | 1.26H | 2.53H | 670.9µH/Ω | 2.68mH/Ω | 5.37mH/Ω
OXYGEN | 20V | 32.89mA | 164.5mW | 220nF | 1.41µF | 5.5µF | 32.86mH | 131mH | 262mH | 216.2µH/Ω | 864.8µH/Ω | 1.73mH/Ω
NON-HAZARDOUS
NON-HAZARDOUS
HAZARDOUS LOCATION
Class I, II, III, Division 1, Groups A, B, C, D, E, F and G Hazardous Location
Class I, Zone 0 Explosive Atmosphere
moisture.IQ - DC Version
SEE NOTE 3
DC POWER
FAULT ALARM
ETHERNET
USB A
USB B
IEEE-488
2X CAN
RS232 / RS485
AUX IN / OUT
ALARMS
Non-Intrinsically Safe Circuits
Intrinsically Safe Circuits
MIS
1 - BK
2 - WT
M-SERIES
1 - SH
2 - BK
3 - WT
4 - GR
5 - RD
O2T
1 - BL
2 - YW
OXYGEN
1 - BK
2 - WT
3 - GR
4 - RD
SEE NOTES 8, 9, 12, & TABLE 1
SEE NOTES 8, 12, & TABLE 1
SEE NOTES 8, 12, & TABLE 1
SEE NOTES 8, 12, & TABLE 1
Notes:
1) No revision to drawing without prior FM approval.
2) When installing the moisture.IQ, the requirements in this installation drawing must be followed.
3) The control room equipment connected to associated apparatus must not generate more than 250 Vrms/Vdc or the marked Um on the associated apparatus, whichever is less.
4) Installations in the U.S. shall be in accordance with ANSI/ISA RP12.06.01 "Installation of Intrinsically Safe Systems for Hazardous (Classified)Locations" and the latest edition of the National Electrical Code (ANSI/NFPA 70).
5) Installations in Canada shall be in accordance with the latest edition of the C22.1 Canadian Electrical Code, Part I.
6) Installations in Europe shall be in accordance with EN 60079-14 and the latest edition of the local wiring code.
7) Installations for IECEx certification shall be in accordance with the latest edition of the local wiring code.
8) The Entity Concept allows interconnection of associated apparatus and intrinsically safe apparatus when the following is true: Uo <= Ui , Io <= Ii , Po <= Pi , Co >= Ci + Ccable, Lo >= Li + Lcable.
9) The MIS (MISP) circuit outputs of the moisture.IQ are non-linear. Install each MISP circuit as a separate intrinsically safe circuit per article 504.30 of the NEC. The shield is not required if another method of intrinsically safe to intrinsically safe separation in accordance with article 504.30 is achieved.
10) For clarity purposes, the schematic above shows the intrinsically safe connections for one channel of the moisture.IQ. A moisture.IQ system may have up to six such channels. For installations in the U.S., all intrinsically safe circuits are required to be separated per article 504.30 of the NEC. For installations in Canada and installations for ATEX and IECEx certification, all intrinsically safe circuits are required to be separated per local wiring codes.
11) Wire moisture.IQ according to local electrical codes. All non-intrinsically safe wiring is required to be segregated from intrinsically safe wiring by a distance of at least 50mm.
12) Devices in the hazardous location can be simple apparatus devices or intrinsically safe apparatus devices. For installation in the U.S., intrinsically safe apparatus must be certified by FM Approvals. For installation in Canada, intrinsically safe apparatus must be Canadian certified. For installation in Europe, intrinsically safe apparatus must be ATEX certified. For IECEx installation, intrinsically safe apparatus must be IECEx certified.
WARNING - Substitution of components may impair intrinsic safety.
WARNING - To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.
CHANGES TO THIS DRAWING REQUIRE AGENCY APPROVAL. CONTACT CERTIFICATION ENGINEER.
COPYRIGHT 2013 GENERAL ELECTRIC CO.
PROPRIETARY INFORMATION- THIS DRAWING CONTAINS PROPRIETARY INFORMATION OF GENERAL ELECTRIC CO. AND MAY NOT BE VIEWED OR DISCLOSED TO OTHERS, EXCEPT WITH THE WRITTEN PERMISSION OF GENERAL ELECTRIC CO.
DRAWN 05/16/13 JC
APPR'D
CHECKED
SALES
CERT
QC
SIZE C
DRAWING NUMBER 752-364
REV 8
SCALE 1:1
DO NOT SCALE DWG
SHEET 2 OF 2

Figure 51: Dwg. 752-364, sh. 2

The product cannot be repaired by the user; it must be replaced by an equivalent certified product. Repairs should only be carried out by the manufacturer or by an approve repairer

Only trained, competent personnel may install, operate and maintain the equipment

If you have questions about whether the apparatus can be used safely in the intended area under the expected operating conditions, please call an applications engineer.

See the rear cover of this manual for contact information.

B.2 Special Conditions for Safe Use

Not applicable

B.3 Markings

Markings shall appear on the product as shown in *Figure 52* and *Figure 53* below:

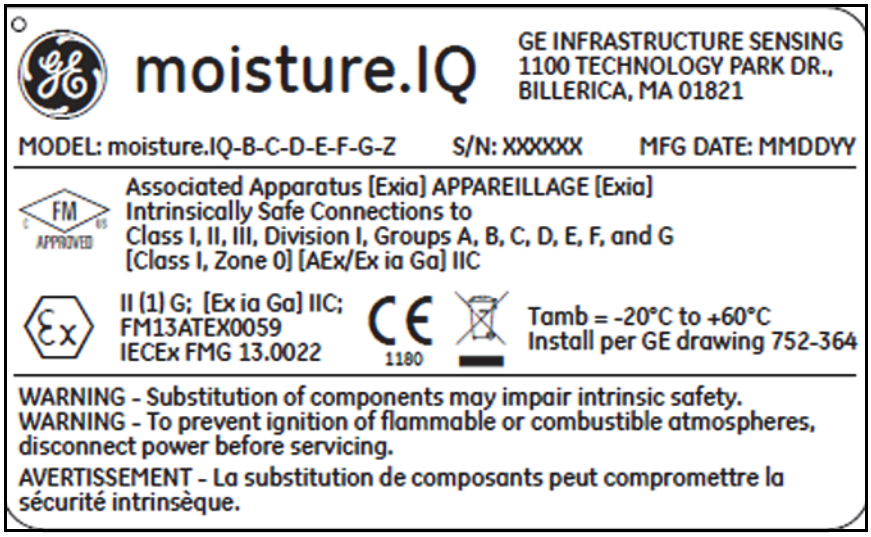
moisture.IQ
GE INFRASTRUCTURE SENSING
1100 TECHNOLOGY PARK DR.,
BILLERICA, MA 01821
MODEL: moisture.IQ-B-C-D-E-F-G-Z
S/N: XXXXXX
MFG DATE: MMDDYY
FM
APPROVED
Associated Apparatus [Exia] APPAREILLAGE [Exia]
Intrinsically Safe Connections to
Class I, II, III, Division I, Groups A, B, C, D, E, F, and G
[Class I, Zone 0] [AEx/Ex ia Ga] IIC
II (1) G; [Ex ia Ga] IIC;
FM13ATEX0059
IECEx FMG 13.0022
CE
1180
Tamb = -20°C to +60°C
Install per GE drawing 752-364
WARNING - Substitution of components may impair intrinsic safety.
WARNING - To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.
AVERTISSEMENT - La substitution de composants peut compromettre la sécurité intrinsèque.

Figure 52: Label from Billerica, MA, USA

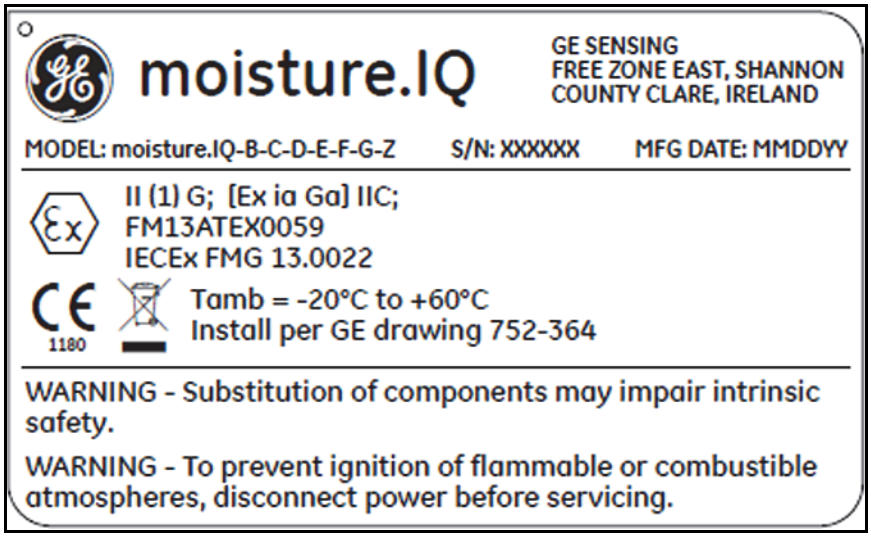

Figure 53: Label from Shannon, Ireland

[no content intended for this page]

Appendix C. Installation Drawings

C.1 Benchtop Model

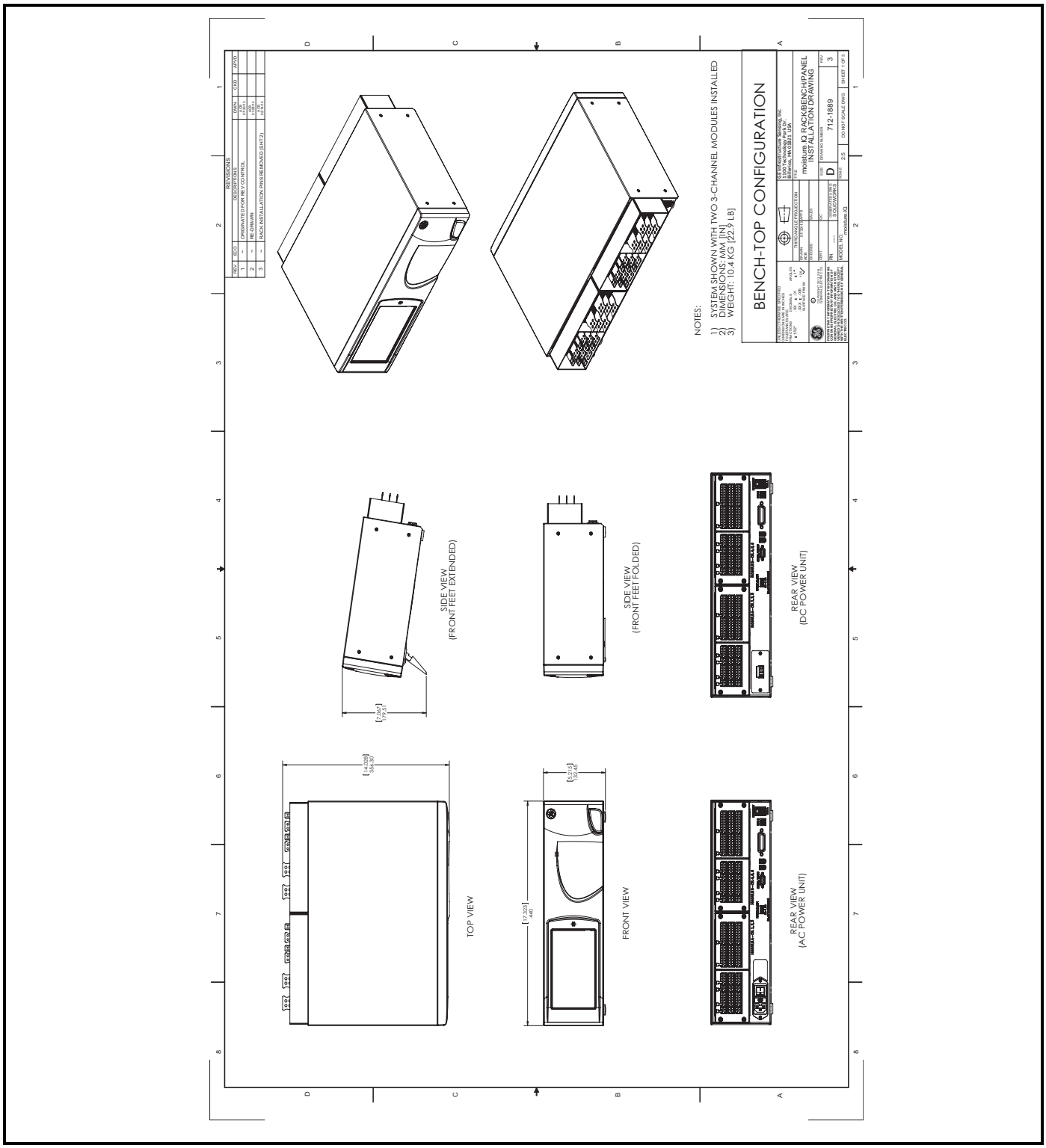

Figure 54: moisture.IQ Installation -- Benchtop Configuration (Dwg. 712-1889, rev. 3, sh. 1)

C.2 Rack Mount Model

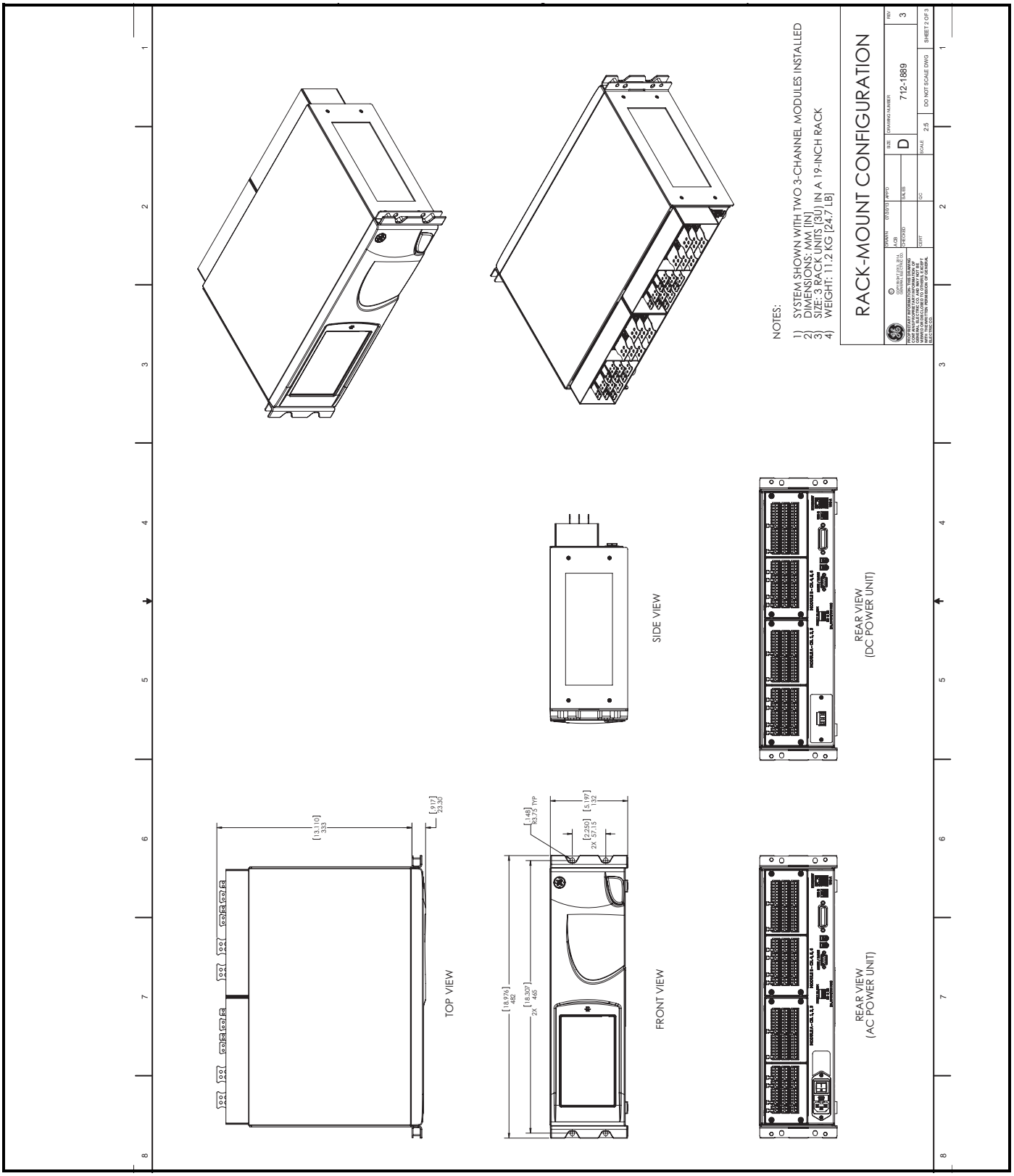
RACK-MOUNT CONFIGURATION
NOTES:
1) SYSTEM SHOWN WITH TWO 3-CHANNEL MODULES INSTALLED
2) DIMENSIONS: MM [IN]
3) SIZE: 3 RACK UNITS [3U] IN A 19-INCH RACK
4) WEIGHT: 11.2 KG [24.7 LB]
712-1889
SIDE VIEW
REAR VIEW (DC POWER UNIT)
TOP VIEW
FRONT VIEW
REAR VIEW (AC POWER UNIT)

Figure 55: moisture.IQ Installation -- Rack Mount Configuration (Dwg. 712-1889, rev. 3, sh. 2)

C.3 Panel Mount Model

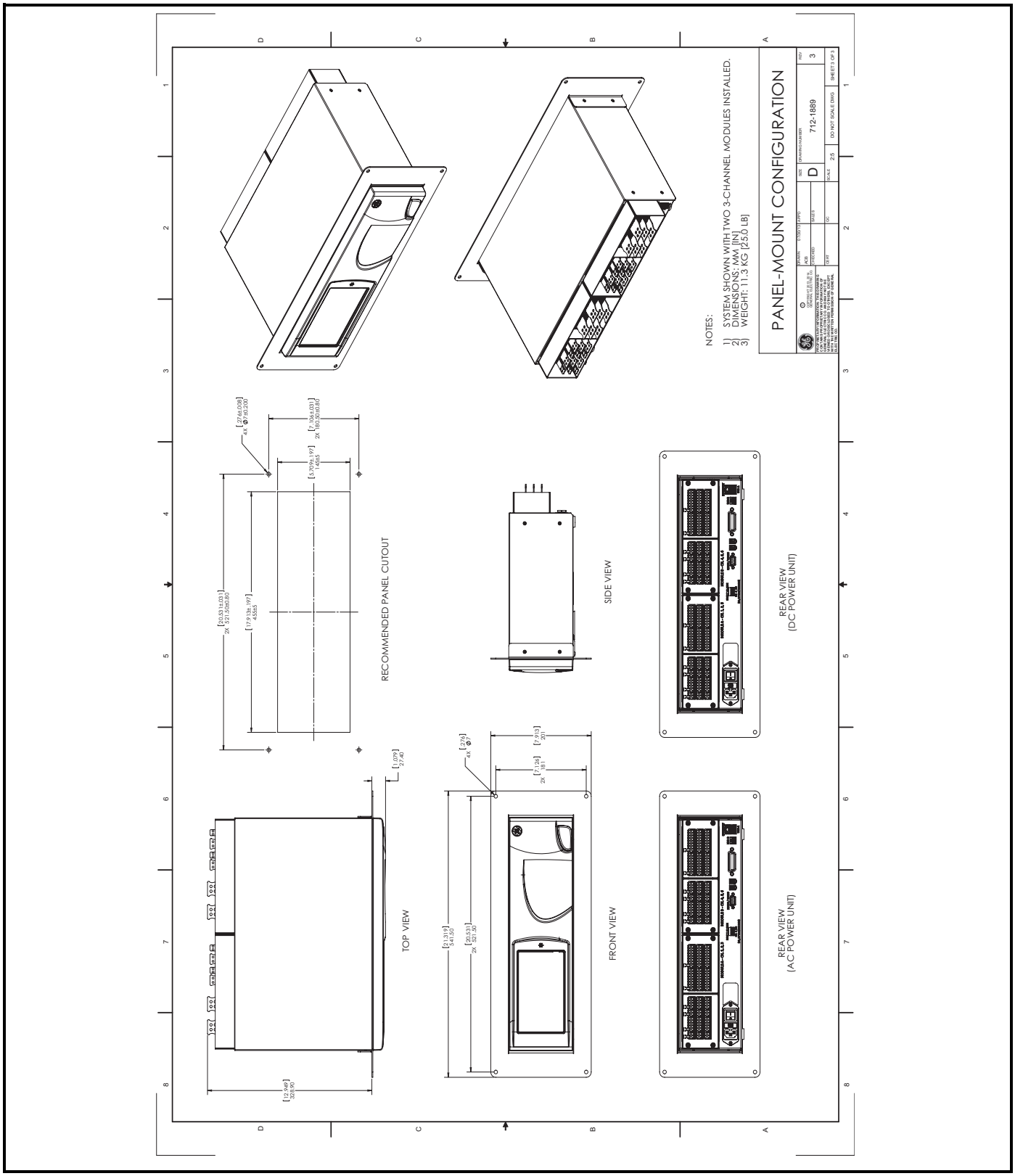

Figure 56: moisture.IQ Installation -- Panel Mount Configuration (Dwg. 712-1889, rev. 3, sh. 3)

[no content intended for this page]

Appendix D. Updating moisture.IQ Firmware

D.1 Steps for Updating Firmware

1. Power on the moisture.IQ.
2. Plug the USB flash drive (with software updates) into the moisture.IQ chassis.

Figure 57: USB Flash Drive in Rear of Chassis

3. From the main screen, press the **Settings** menu button.

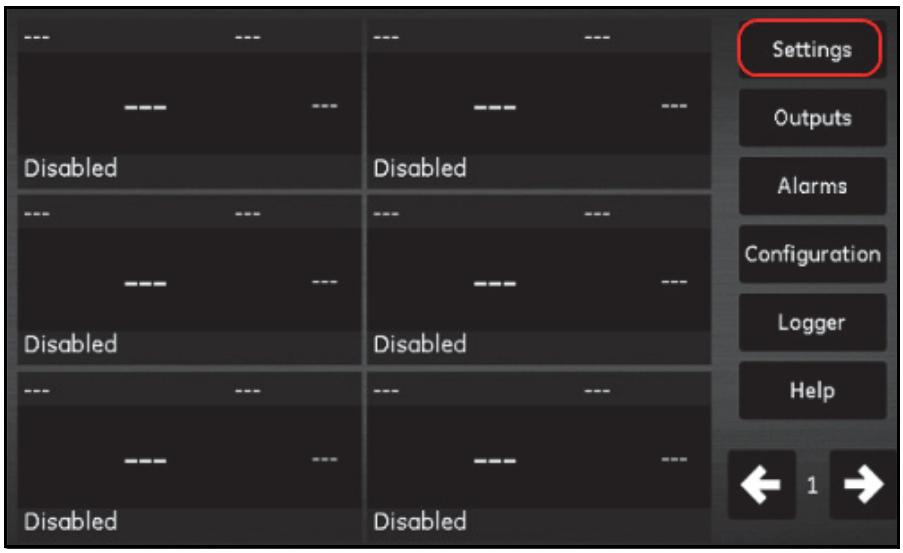

Figure 58: Settings Button on the Main Screen

D.1 Steps for Updating Firmware (cont.)

4. In the Service option, press **Software Update**. If **Software Update** is grayed out, check to ensure the USB flash drive is plugged into the rear USB port.

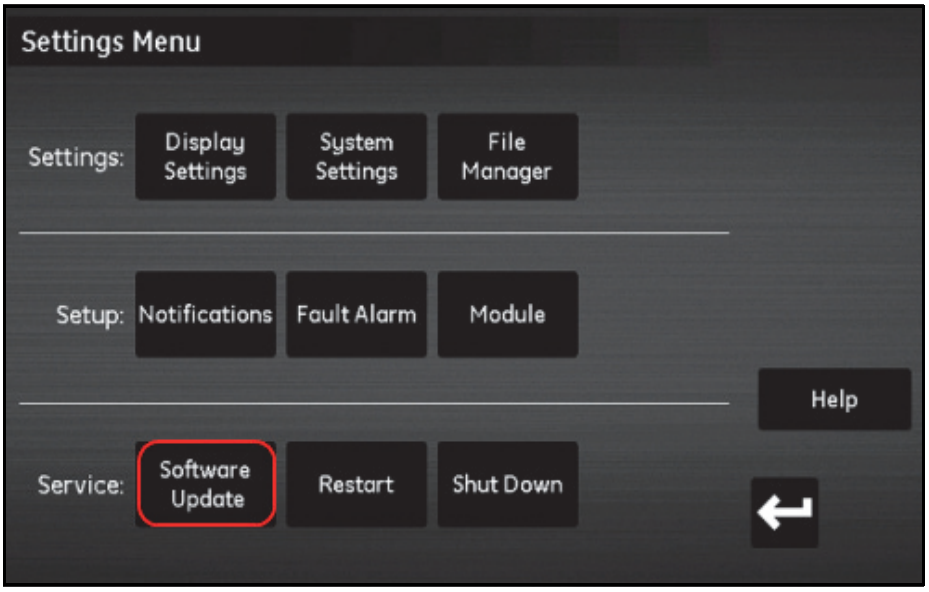

Figure 59: Software Update

5. The moisture.IQ prompts you to confirm you want to update the software. Press **Yes.**

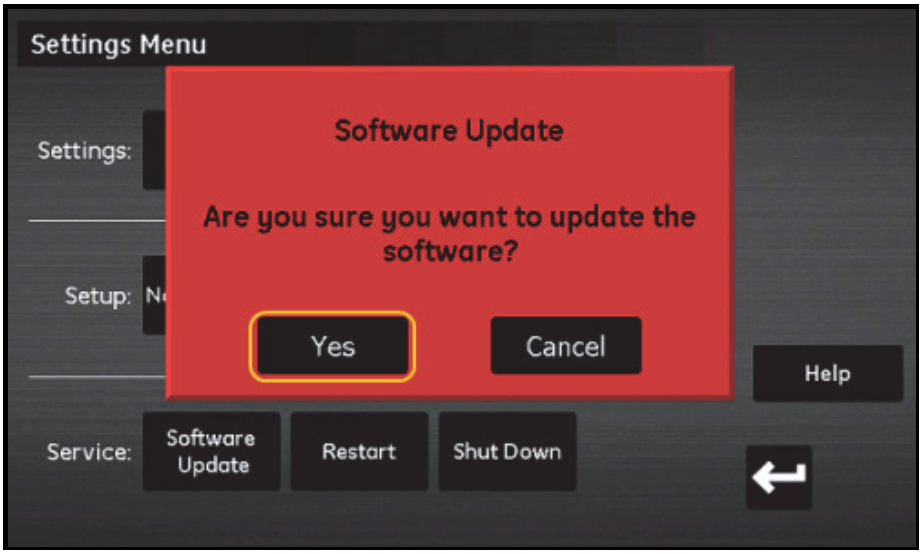

Figure 60: Update Confirmation

D.1 Steps for Updating Firmware (cont.)

Updating the software will take a few minutes. The screen in Figure 61 below will appear during the update.

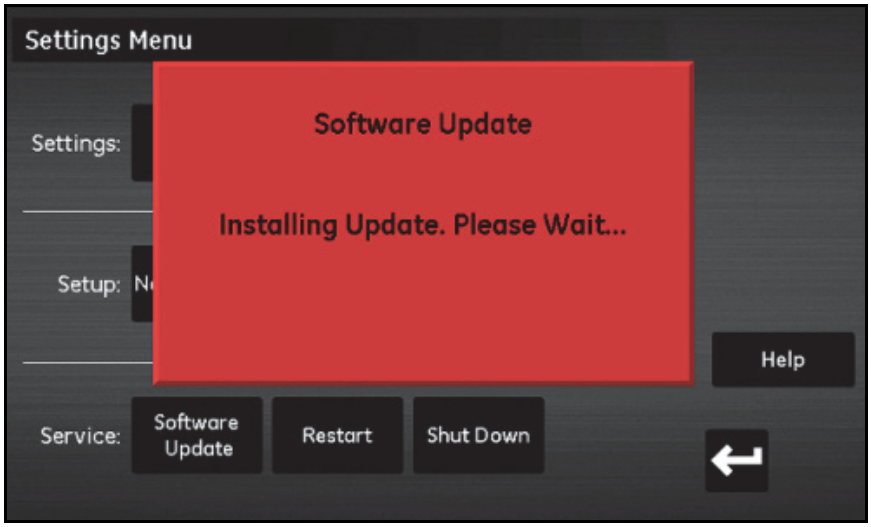

Figure 61: Installation Screen

6. Once the software update is completes, the meter will prompt for restart. Press **Restart** to reboot the moisture.IQ unit.

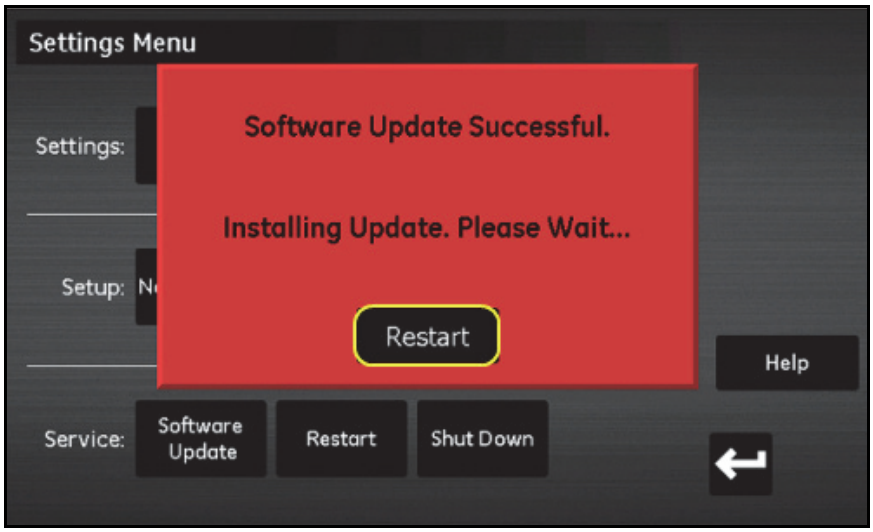

Figure 62: Rebooting Screen

The unit will reboot with the updated firmware.

Appendix E. Modbus Maps

Table 12: Modbus Maps

Function	Parameter	Sub Parameter	ID	ModBus Address	Type	Access	Modbus Request	Qty. of Registers	Notes
0	Error register, non-latching. Read only.		0	0	32-bit Integer	RO	Read Input (0x04)	2	
1000	Latching Error Register		0	1000	32-bit Integer	RW	Read Holding (0x03)	2	Write 0 to clear
2000	Analog Output (4-20)		0	2000					
	Channel 1 / Output A	Output (percent of scale)	100	2100	32-bit float	RW	Read Holding (0x03)	2	When TEST MODE enabled, force output to value
		State	102	2102	32-bit Integer	RW	Read Holding (0x03)	2	0 = OFF, 1 = ON, 2 = TEST MODE
		Units	104	2104	32-bit Integer	RW	Read Holding (0x03)	2	Measurement/ Unit Code - See tab
		Type	106	2106	32-bit Integer	RW	Read Holding (0x03)	2	0 = 4-20 mA, 1 = 0-20 mA, 2 = 0-2 volts
		Zero	108	2108	32-bit float	RW	Read Holding (0x03)	2	
		Span	110	2110	32-bit float	RW	Read Holding (0x03)	2	
	Channel 1 / Output B	Output (percent of scale)	120	2120	32-bit float	RW	Read Holding (0x03)	2	When TEST MODE enabled, force output to value
		State	122	2122	32-bit Integer	RW	Read Holding (0x03)	2	0 = OFF, 1 = ON, 2 = TEST MODE
		Units	124	2124	32-bit Integer	RW	Read Holding (0x03)	2	Measurement/ Unit Code - See tab
		Type	126	2126	32-bit Integer	RW	Read Holding (0x03)	2	0 = 4-20 mA, 1 = 0-20 mA, 2 = 0-2 volts
		Zero	128	2128	32-bit float	RW	Read Holding (0x03)	2	
		Span	130	2130	32-bit float	RW	Read Holding (0x03)	2	
	Channel 2 / Output A	Output (percent of scale)	200	2200	32-bit float	RW	Read Holding (0x03)	2	When TEST MODE enabled, force output to value
		State	202	2202	32-bit Integer	RW	Read Holding (0x03)	2	0 = OFF, 1 = ON, 2 = TEST MODE
		Units	204	2204	32-bit Integer	RW	Read Holding (0x03)	2	Measurement/ Unit Code - See tab

Table 12: Modbus Maps (cont.)

Function	Parameter	Sub Parameter	ID	ModBus Address	Type	Access	Modbus Request	Qty. of Registers	Notes
		Type	206	2206	32-bit Integer	RW	Read Holding (0x03)	2	0 = 4-20 mA, 1 = 0-20 mA, 2 = 0-2 volts
		Zero	208	2208	32-bit float	RW	Read Holding (0x03)	2	
		Span	210	2210	32-bit float	RW	Read Holding (0x03)	2	
	Channel 2 / Output B	Output (percent of scale)	220	2220	32-bit float	RW	Read Holding (0x03)	2	When TEST MODE enabled, force output to value
		State	222	2222	32-bit Integer	RW	Read Holding (0x03)	2	0 = OFF, 1 = ON, 2 = TEST MODE
		Units	224	2224	32-bit Integer	RW	Read Holding (0x03)	2	Measurement/ Unit Code - See tab
		Type	226	2226	32-bit Integer	RW	Read Holding (0x03)	2	0 = 4-20 mA, 1 = 0-20 mA, 2 = 0-2 volts
		Zero	228	2228	32-bit float	RW	Read Holding (0x03)	2	
		Span	230	2230	32-bit float	RW	Read Holding (0x03)	2	
	Channel 3 / Output A	Output (percent of scale)	300	2300	32-bit float	RW	Read Holding (0x03)	2	When TEST MODE enabled, force output to value
		State	302	2302	32-bit Integer	RW	Read Holding (0x03)	2	0 = OFF, 1 = ON, 2 = TEST MODE
		Units	304	2304	32-bit Integer	RW	Read Holding (0x03)	2	Measurement/ Unit Code - See tab
		Type	306	2306	32-bit Integer	RW	Read Holding (0x03)	2	0 = 4-20 mA, 1 = 0-20 mA, 2 = 0-2 volts
		Zero	308	2308	32-bit float	RW	Read Holding (0x03)	2	
		Span	310	2310	32-bit float	RW	Read Holding (0x03)	2	
	Channel 3 / Output B	Output (percent of scale)	320	2320	32-bit float	RW	Read Holding (0x03)	2	When TEST MODE enabled, force output to value
		State	322	2322	32-bit Integer	RW	Read Holding (0x03)	2	0 = OFF, 1 = ON, 2 = TEST MODE
		Units	324	2324	32-bit Integer	RW	Read Holding (0x03)	2	Measurement/ Unit Code - See tab
		Type	326	2326	32-bit Integer	RW	Read Holding (0x03)	2	0 = 4-20 mA, 1 = 0-20 mA, 2 = 0-2 volts
		Zero	328	2328	32-bit float	RW	Read Holding (0x03)	2	
		Span	330	2330	32-bit float	RW	Read Holding (0x03)	2	

Table 12: Modbus Maps (cont.)

Function	Parameter	Sub Parameter	ID	ModBus Address	Type	Access	Modbus Request	Qty. of Registers	Notes
	Channel 4 / Output A	Output (percent of scale)	400	2400	32-bit float	RW	Read Holding (0x03)	2	When TEST MODE enabled, force output to value
		State	402	2402	32-bit Integer	RW	Read Holding (0x03)	2	0 = OFF, 1 = ON, 2 = TEST MODE
		Units	404	2404	32-bit Integer	RW	Read Holding (0x03)	2	Measurement/ Unit Code - See tab
		Type	406	2406	32-bit Integer	RW	Read Holding (0x03)	2	0 = 4-20 mA, 1 = 0-20 mA, 2 = 0-2 volts
		Zero	408	2408	32-bit float	RW	Read Holding (0x03)	2	
		Span	410	2410	32-bit float	RW	Read Holding (0x03)	2	
	Channel 4 / Output B	Output (percent of scale)	420	2420	32-bit float	RW	Read Holding (0x03)	2	When TEST MODE enabled, force output to value
		State	422	2422	32-bit Integer	RW	Read Holding (0x03)	2	0 = OFF, 1 = ON, 2 = TEST MODE
		Units	424	2424	32-bit Integer	RW	Read Holding (0x03)	2	Measurement/ Unit Code - See tab
		Type	426	2426	32-bit Integer	RW	Read Holding (0x03)	2	0 = 4-20 mA, 1 = 0-20 mA, 2 = 0-2 volts
		Zero	428	2428	32-bit float	RW	Read Holding (0x03)	2	
		Span	430	2430	32-bit float	RW	Read Holding (0x03)	2	
	Channel 5 / Output A	Output (percent of scale)	500	2500	32-bit float	RW	Read Holding (0x03)	2	When TEST MODE enabled, force output to value
		State	502	2502	32-bit Integer	RW	Read Holding (0x03)	2	0 = OFF, 1 = ON, 2 = TEST MODE
		Units	504	2504	32-bit Integer	RW	Read Holding (0x03)	2	Measurement/ Unit Code - See tab
		Type	506	2506	32-bit Integer	RW	Read Holding (0x03)	2	0 = 4-20 mA, 1 = 0-20 mA, 2 = 0-2 volts
		Zero	508	2508	32-bit float	RW	Read Holding (0x03)	2	
		Span	510	2510	32-bit float	RW	Read Holding (0x03)	2	
	Channel 5 / Output B	Output (percent of scale)	520	2520	32-bit float	RW	Read Holding (0x03)	2	When TEST MODE enabled, force output to value
		State	522	2522	32-bit Integer	RW	Read Holding (0x03)	2	0 = OFF, 1 = ON, 2 = TEST MODE

Table 12: Modbus Maps (cont.)

Function	Parameter	Sub Parameter	ID	ModBus Address	Type	Access	Modbus Request	Qty. of Registers	Notes
		Units	524	2524	32-bit Integer	RW	Read Holding (0x03)	2	Measurement/ Unit Code - See tab
		Type	526	2526	32-bit Integer	RW	Read Holding (0x03)	2	0 = 4-20 mA, 1 = 0-20 mA, 2 = 0-2 volts
		Zero	528	2528	32-bit float	RW	Read Holding (0x03)	2	
		Span	530	2530	32-bit float	RW	Read Holding (0x03)	2	
	Channel 6 / Output A	Output (percent of scale)	600	2600	32-bit float	RW	Read Holding (0x03)	2	When TEST MODE enabled, force output to value
		State	602	2602	32-bit Integer	RW	Read Holding (0x03)	2	0 = OFF, 1 = ON, 2 = TEST MODE
		Units	604	2604	32-bit Integer	RW	Read Holding (0x03)	2	Measurement/ Unit Code - See tab
		Type	606	2606	32-bit Integer	RW	Read Holding (0x03)	2	0 = 4-20 mA, 1 = 0-20 mA, 2 = 0-2 volts
		Zero	608	2608	32-bit float	RW	Read Holding (0x03)	2	
		Span	610	2610	32-bit float	RW	Read Holding (0x03)	2	
	Channel 6 / Output B	Output (percent of scale)	620	2620	32-bit float	RW	Read Holding (0x03)	2	When TEST MODE enabled, force output to value
		State	622	2622	32-bit Integer	RW	Read Holding (0x03)	2	0 = OFF, 1 = ON, 2 = TEST MODE
		Units	624	2624	32-bit Integer	RW	Read Holding (0x03)	2	Measurement/ Unit Code - See tab
		Type	626	2626	32-bit Integer	RW	Read Holding (0x03)	2	0 = 4-20 mA, 1 = 0-20 mA, 2 = 0-2 volts
		Zero	628	2628	32-bit float	RW	Read Holding (0x03)	2	
		Span	630	2630	32-bit float	RW	Read Holding (0x03)	2	
3000	All Alarm Status		0	3000	32-bit Integer	RO	Read Input (0x04)	2	Bitwise Alarm Status. 1 = Energized 0 = De-energized 00:00:00:00:00:00Even bit = Alarm A, Odd bit = Alarm B
	Channel 1 / Alarm A	Status	100	3100	32-bit Integer	RO	Read Input (0x04)	2	1 = Energized 0 = De-energized
		State	102	3102	32-bit Integer	RW	Read Holding (0x03)	2	0 = OFF, 1 = ON

Table 12: Modbus Maps (cont.)

Function	Parameter	Sub Parameter	ID	ModBus Address	Type	Access	Modbus Request	Qty. of Registers	Notes
		Units	104	3104	32-bit Integer	RW	Read Holding (0x03)	2	Measurement/ Unit Code - See tab
		Type	106	3106	32-bit Integer	RW	Read Holding (0x03)	2	0 = In Band, 1 = Out Band, 2 = Setpoint
		Lower Setpoint	108	3108	32-bit float	RW	Read Holding (0x03)	2	
		Upper Setpoint	110	3110	32-bit float	RW	Read Holding (0x03)	2	
	Channel 1 / Alarm B	Status	120	3120	32-bit Integer	RO	Read Input (0x04)	2	1 = Energized 0 = De-energized
		State	122	3122	32-bit Integer	RW	Read Holding (0x03)	2	0 = OFF, 1 = ON
		Units	124	3124	32-bit Integer	RW	Read Holding (0x03)	2	Measurement/ Unit Code - See tab
		Type	126	3126	32-bit Integer	RW	Read Holding (0x03)	2	0 = In Band, 1 = Out Band, 2 = Setpoint
		Lower Setpoint	128	3128	32-bit float	RW	Read Holding (0x03)	2	
		Upper Setpoint	130	3130	32-bit float	RW	Read Holding (0x03)	2	
	Channel 2 / Alarm A	Status	200	3200	32-bit Integer	RO	Read Input (0x04)	2	1 = Energized 0 = De-energized
		State	202	3202	32-bit Integer	RW	Read Holding (0x03)	2	0 = OFF, 1 = ON
		Units	204	3204	32-bit Integer	RW	Read Holding (0x03)	2	Measurement/ Unit Code - See tab
		Type	206	3206	32-bit Integer	RW	Read Holding (0x03)	2	0 = In Band, 1 = Out Band, 2 = Setpoint
		Lower Setpoint	208	3208	32-bit float	RW	Read Holding (0x03)	2	
		Upper Setpoint	210	3210	32-bit float	RW	Read Holding (0x03)	2	
	Channel 2 / Alarm B	Status	220	3220	32-bit Integer	RO	Read Input (0x04)	2	1 = Energized 0 = De-energized
		State	222	3222	32-bit Integer	RW	Read Holding (0x03)	2	0 = OFF, 1 = ON
		Units	224	3224	32-bit Integer	RW	Read Holding (0x03)	2	Measurement/ Unit Code - See tab
		Type	226	3226	32-bit Integer	RW	Read Holding (0x03)	2	0 = In Band, 1 = Out Band, 2 = Setpoint
		Lower Setpoint	228	3228	32-bit float	RW	Read Holding (0x03)	2	
		Upper Setpoint	230	3230	32-bit float	RW	Read Holding (0x03)	2	
	Channel 3 / Alarm A	Status	300	3300	32-bit Integer	RO	Read Input (0x04)	2	1 = Energized 0 = De-energized

Table 12: Modbus Maps (cont.)

Function	Parameter	Sub Parameter	ID	ModBus Address	Type	Access	Modbus Request	Qty. of Registers	Notes
		State	302	3302	32-bit Integer	RW	Read Holding (0x03)	2	0 = OFF, 1 = ON
		Units	304	3304	32-bit Integer	RW	Read Holding (0x03)	2	Measurement/ Unit Code - See tab
		Type	306	3306	32-bit Integer	RW	Read Holding (0x03)	2	0 = In Band, 1 = Out Band, 2 = Setpoint
		Lower Setpoint	308	3308	32-bit float	RW	Read Holding (0x03)	2	
		Upper Setpoint	310	3310	32-bit float	RW	Read Holding (0x03)	2	
	Channel 3 / Alarm B	Status	320	3320	32-bit Integer	RO	Read Input (0x04)	2	1 = Energized 0 = De-energized
		State	322	3322	32-bit Integer	RW	Read Holding (0x03)	2	0 = OFF, 1 = ON
		Units	324	3324	32-bit Integer	RW	Read Holding (0x03)	2	Measurement/ Unit Code - See tab
		Type	326	3326	32-bit Integer	RW	Read Holding (0x03)	2	0 = In Band, 1 = Out Band, 2 = Setpoint
		Lower Setpoint	328	3328	32-bit float	RW	Read Holding (0x03)	2	
		Upper Setpoint	330	3330	32-bit float	RW	Read Holding (0x03)	2	
	Channel 4 / Alarm A	Status	400	3400	32-bit Integer	RO	Read Input (0x04)	2	1 = Energized 0 = De-energized
		State	402	3402	32-bit Integer	RW	Read Holding (0x03)	2	0 = OFF, 1 = ON
		Units	404	3404	32-bit Integer	RW	Read Holding (0x03)	2	Measurement/ Unit Code - See tab
		Type	406	3406	32-bit Integer	RW	Read Holding (0x03)	2	0 = In Band, 1 = Out Band, 2 = Setpoint
		Lower Setpoint	408	3408	32-bit float	RW	Read Holding (0x03)	2	
		Upper Setpoint	410	3410	32-bit float	RW	Read Holding (0x03)	2	
	Channel 4 / Alarm B	Status	420	3420	32-bit Integer	RO	Read Input (0x04)	2	1 = Energized 0 = De-energized
		State	422	3422	32-bit Integer	RW	Read Holding (0x03)	2	0 = OFF, 1 = ON
		Units	424	3424	32-bit Integer	RW	Read Holding (0x03)	2	Measurement/ Unit Code - See tab
		Type	426	3426	32-bit Integer	RW	Read Holding (0x03)	2	0 = In Band, 1 = Out Band, 2 = Setpoint
		Lower Setpoint	428	3428	32-bit float	RW	Read Holding (0x03)	2	
		Upper Setpoint	430	3430	32-bit float	RW	Read Holding (0x03)	2	

Table 12: Modbus Maps (cont.)

Function	Parameter	Sub Parameter	ID	ModBus Address	Type	Access	Modbus Request	Qty. of Registers	Notes
	Channel 5 / Alarm A	Status	500	3500	32-bit Integer	RO	Read Input (0x04)	2	1 = Energized 0 = De-energized
		State	502	3502	32-bit Integer	RW	Read Holding (0x03)	2	0 = OFF, 1 = ON
		Units	504	3504	32-bit Integer	RW	Read Holding (0x03)	2	Measurement/ Unit Code - See tab
		Type	506	3506	32-bit Integer	RW	Read Holding (0x03)	2	0 = In Band, 1 = Out Band, 2 = Setpoint
		Lower Setpoint	508	3508	32-bit float	RW	Read Holding (0x03)	2	
		Upper Setpoint	510	3510	32-bit float	RW	Read Holding (0x03)	2	
	Channel 5 / Alarm B	Status	520	3520	32-bit Integer	RO	Read Input (0x04)	2	1 = Energized 0 = De-energized
		State	522	3522	32-bit Integer	RW	Read Holding (0x03)	2	0 = OFF, 1 = ON
		Units	524	3524	32-bit Integer	RW	Read Holding (0x03)	2	Measurement/ Unit Code - See tab
		Type	526	3526	32-bit Integer	RW	Read Holding (0x03)	2	0 = In Band, 1 = Out Band, 2 = Setpoint
		Lower Setpoint	528	3528	32-bit float	RW	Read Holding (0x03)	2	
		Upper Setpoint	530	3530	32-bit float	RW	Read Holding (0x03)	2	
	Channel 6 / Alarm A	Status	600	3600	32-bit Integer	RO	Read Input (0x04)	2	1 = Energized 0 = De-energized
		State	602	3602	32-bit Integer	RW	Read Holding (0x03)	2	0 = OFF, 1 = ON
		Units	604	3604	32-bit Integer	RW	Read Holding (0x03)	2	Measurement/ Unit Code - See tab
		Type	606	3606	32-bit Integer	RW	Read Holding (0x03)	2	0 = In Band, 1 = Out Band, 2 = Setpoint
		Lower Setpoint	608	3608	32-bit float	RW	Read Holding (0x03)	2	
		Upper Setpoint	610	3610	32-bit float	RW	Read Holding (0x03)	2	
	Channel 6 / Alarm B	Status	620	3620	32-bit Integer	RO	Read Input (0x04)	2	1 = Energized 0 = De-energized
		State	622	3622	32-bit Integer	RW	Read Holding (0x03)	2	0 = OFF, 1 = ON
		Units	624	3624	32-bit Integer	RW	Read Holding (0x03)	2	Measurement/ Unit Code - See tab
		Type	626	3626	32-bit Integer	RW	Read Holding (0x03)	2	0 = In Band, 1 = Out Band, 2 = Setpoint
		Lower Setpoint	628	3628	32-bit float	RW	Read Holding (0x03)	2	

Table 12: Modbus Maps (cont.)

Function	Parameter	Sub Parameter	ID	ModBus Address	Type	Access	Modbus Request	Qty. of Registers	Notes
		Upper Setpoint	630	3630	32-bit float	RW	Read Holding (0x03)	2	
5000	Block Measurement Read						Read Holding (0x03)	2-32	Returns 1-16 measurements
		Block Measurement 0	0	5000	32-bit float	RO	Read Input (0x04)	2	Returns Block Measurement 0
		Block Measurement Units 0	0	5000	32-bit Integer	RW	Preset Register (0x06)	2	Set Unit Code for Measurement 0
		Block Measurement Units 0	0	5000	32-bit Integer	RW	Read Holding (0x03)	2	Get Unit Code for Measurement 0
		Block Measurement 1	2	5002	32-bit float	RO	Read Input (0x04)	2	Returns Block Measurement 1
		Block Measurement Units 1	2	5002	32-bit Integer	RW	Preset Register (0x06)	2	Set Unit Code for Measurement 1
		Block Measurement Units 1	2	5002	32-bit Integer	RW	Read Holding (0x03)	2	Get Unit Code for Measurement 1
		Block Measurement 2	4	5004	32-bit float	RO	Read Input (0x04)	2	Returns Block Measurement 2
		Block Measurement Units 2	4	5004	32-bit Integer	RW	Preset Register (0x06)	2	Set Unit Code for Measurement 2
		Block Measurement Units 2	4	5004	32-bit Integer	RW	Read Holding (0x03)	2	Get Unit Code for Measurement 2
		Block Measurement 3	6	5006	32-bit float	RO	Read Input (0x04)	2	Returns Block Measurement 3
		Block Measurement Units 3	6	5006	32-bit Integer	RW	Preset Register (0x06)	2	Set Unit Code for Measurement 3
		Block Measurement Units 3	6	5006	32-bit Integer	RW	Read Holding (0x03)	2	Get Unit Code for Measurement 3
	(repeats for measurements 4-15)	Block Measurement 4	8	5008					

A

Alarm Relay Outputs 79
Alarms, Setting up 51
Aluminum oxide probe 76
Analog Outputs 79
Auto-Calibration 78

B

Background Gas Correction Factors 66
Backlight Timeout 30
Backup Files 35
Brightness 30

C

Cable Error 19
Cables
  Installation Restrictions 2
Cables, Acceptable Lengths for 19
Calibration
  Replacing Probes 64
Calibration Errors 71
Calibration Reminder 31
Certification 93
Communications Settings
  Setting up Communications 46
Configuration Menu 36
Configuration Types 75

D

Data Logging 78
Data Views 30
Delta F Oxygen Cell 84
  Accuracy 84
  Ambient Temperature 84
  Available Cells 84
  Background Gas Compatibility 84
  Response Time 84
  Sample Requirements 85
  Sensitivity 84
Dew/Frost Point Temperature 76
Digital Outputs 79
Display 78
Display Settings, Entering 30
Document Number i

E

Electrical Connections 12
  Moisture Image Series Probe 17
  Oxygen Cell 19
Electrolyte
  Adding to Oxygen Cell 11
  Checking Level 62
Electronics Unit
  Installation Site 2
  Mounting 7
European Compliance 75

F

Fault Alarm, Setting up 32
File Manager 35
Firmware, Updating 101
Fuses 75

G

Gas Flow
  Establishing for Oxygen Cell 24

H

Help button 28

I

Inputs
  Specifications 80
Installation
  Benchtop Drawing 97
  Electrical Connections 12
  Electronics Unit 7
  Establishing a Gas Flow Through the Oxygen Cell . 24
  Moisture Probe Considerations 3
  Panel Mount Drawing 99
  Probes into Sample System 9
  Rack Mount Drawing 98
  Sample System 5, 7
  Site Selection 2

L

Logs, Setting up 52

M

M Series Probe
- Built-in Temperature Sensor . . . 83
- Connecting . . . 14
- Flow Range . . . 83
- Impedance Range . . . 83
- Installing into Sample System . . . 9
- Operating Pressure . . . 83
- Operating Temperature . . . 83
- Specifications . . . 83

Maintenance
- Oxygen Cell . . . 62
- Replacing and Recalibrating Probes . . . 64

Markings . . . 95
Measurement Parameters . . . 75
Menu Maps . . . 87
MISP2 . . . 81
- Flow Range . . . 81
- Operating Pressure . . . 81
- Process Temperature . . . 81
- Storage Temperature . . . 81

Modbus Maps . . . 105
Moisture Image Series
- Specifications . . . 81

Moisture Image Series Probe . . . 81
- Connecting . . . 17

Moisture Image Series Probe/Analyzer Cable . . . 81
Moisture Image Series Probe/Analyzer Separation . . . 81
Moisture Probe Compatibility . . . 76
Moisture Probes
- Considerations for Installation . . . 3
- Installing into Sample System . . . 9
- Installing into the Sample System . . . 9
- Sample System . . . 5

Mounting
- Electronics Unit . . . 7
- Sample System . . . 7

N

Notifications, Email . . . 31

O

Operating Temperature . . . 78
Output
- Specifications . . . 79

Output Updating . . . 79
Outputs, Setting up . . . 48
Outputs, Testing . . . 48
Outputs, Trimming . . . 49
Oxygen Cell
- Adding Electrolyte . . . 11
- Background Gas Correction Factors . . . 66
- Checking and Replenishing Electrolyte . . . 62
- Connecting . . . 19
- Connecting to the Gas Line . . . 11
- Establishing a Gas Flow . . . 24
- Intrinsic Safety Requirements . . . 19
- Preparing for Installation . . . 11
- Sample Systems . . . 5

Oxygen Measurement
- Accuracy . . . 77
- Range . . . 77

P

Parameters . . . 75
Power Requirements . . . 75
Pressure Measurement
- Accuracy . . . 77
- Range . . . 77

Pressure Transmitter
- Specifications . . . 85

Probe
- Specifications . . . 81

Probe Calibration . . . 40
Probe Configuration . . . 37
Probes
- Replacing and Recalibrating . . . 64

Probes, Setting up . . . 36

R

Range Errors . . . 71
Range Errors, Setting up . . . 33

S

Safety . . . 93

Sample System
Connecting to Gas Line for Oxygen 11
Description of 5
Mounting (Installing) 7
Probes,Installing 9
Screen Messages 70
Sensor Modules, Verifying Setup 34
Settings Menu 28
Signal Errors 71
Site Selection 2
Span Value, Trimming 50
Specifications
Dimensions 75
Electronic 78
Inputs 80
Moisture Measurement 76
Output 79
Overall 75
Oxygen Measurement 77
Power 75
Pressure Measurement 77
Pressure Transmitter 85
Probe 81
Temperature 77
Storage Temperature 78
System Settings, Entering 29

T

Temperature Measurement
Accuracy 77
Range 77
TF Series Probe
Installing into Sample System 9
Traceability 76
Transferring Files to USB Stick 35

U

Updating Firmware 101
User Constants, Entering 44
User Functions, Entering 41
User Management 46
User-Defined Tables, Entering 43

W

Warm-up Time 78

Z

Zero Value, Trimming 49

Customer Support Centers

U.S.A.

The Boston Center
1100 Technology Park Drive
Billerica, MA 01821
U.S.A.
Tel: 800 833 9438 (toll-free)
978 437 1000
E-mail: sensing@ge.com

Ireland

Sensing House
Shannon Free Zone East
Shannon, County Clare
Ireland
Tel: +353 (0)61 470200
E-mail: gesensingsnnservices@ge.com

An ISO 9001:2008 Certified Company

www.ge-mcs.com/en/about_us/quality.html

www.ge-mcs.com

©2014 General Electric Company. All rights reserved.
Technical content subject to change without notice.

910-298 Rev. A_14